THE

JOURNAL OF MENTAL SCIENCE

[*Published by Authority of the*
Royal Medico-Psychological Association]

No. 436 [NEW SERIES NO. 400] JULY, 1958 VOL. 104

Original Articles

PSYCHOSOMATIC ASPECTS OF NARCOLEPSY*

By

COLIN M. SMITH, M.B., Ch.B., F.R.C.P.(C.), D.P.M.

Deputy Director
Psychiatric Research, Psychiatric Services Branch, Department of Public Health,
University Hospital, Saskatoon, Saskatchewan

INTRODUCTION

GELINEAU (1880) introduced the term "narcolepsy" and suggested that it constituted a disease *sui generis.* A careful perusal of the literature, however, shows that the condition had been described previously. Precedence has been claimed for Bright, Thomas Willis and even for Galen! At any rate, Notkin and Jelliffe (1934) were able to unearth 270 cases of narcolepsy and allied conditions in a literature survey covering the years 1813–1931.

Narcolepsy, however, was not even referred to in Osler's *Modern Medicine* (1910) and its incidence almost certainly increased in the 1920s, when most of the classical papers were written (Redlich, 1925, 1931; Adie, 1926, 1930; Lhermitte and Tournay, 1927; Wilson, 1928; Levin, 1929; Thiele and Bernhardt, 1933). Cave's series of 42 cases seen at the Mayo Clinic appeared in 1931 and the fine review of Daniels reporting on 147 cases followed three years later. A new era of treatment opened with the introduction of ephedrine sulphate by Janota and Scala and—independently—by Doyle and Daniels in 1931. In 1935, Prinzmetal and Bloomberg reported that amphetamine sulphate partially relieved the sleepiness. The sympathomimetic amines are still widely used in the symptomatic treatment of the condition though recently it has been suggested (Daly and Yoss, 1956) that methyl phenidyl acetate ("Ritalin") may be superior. Isolated cases of other treatments proving effective have been recorded. Thus Riser and Dardenne (1946) described a case of long-term sleepiness responding to 6 electroshock treatments, while Weitzner (1951, 1952) has described a case of narcolepsy and one of sleep paralysis which responded to insulin hypoglycaemia. Phenurone (Aird *et al.*, 1953) has been used and also glutamic acid (Platania and Mancini, 1955). Potassium has been recommended for cataplexy (Dynes, 1943) but the results have been difficult to evaluate (Aird *et al.*, 1953). It will be recalled that the course of narcolepsy is variable, and it is difficult to draw firm conclusions from small numbers of cases. Daniels reported in the era before ephedrine that almost 50 per cent. of his cases showed some improvement on follow-up after two to three years.

---

* Research supported by National Health Grants, Ottawa, the Rockefeller Foundation, New York and the Saskatchewan Committee on Schizophrenia Research.

There has been much discussion regarding the use of the term "narcolepsy". Some authors feel that it should be restricted to cases showing both the sudden, short, overpowering bursts of sleep ("narcolepsy") and the abrupt attacks of tonelessness with preservation of consciousness ("cataplexy"). Others like Wilson (1928) and Daniels (1934) feel that the lines of differentiation should not be drawn too sharply. At any rate when narcolepsy and cataplexy are present together it is the exception rather than the rule to find definite evidence of organic involvement—hence the terms "idiopathic", "true", or "cryptogenic" narcolepsy. A number of other features may be present also: these include sleep paralysis, sleep hallucinosis, somnambulism, recurrent nightmares, a marked and sudden weight gain, and occasionally, hypogenitality, feminine hair distribution, diplopia and headaches. Most of these phenomena may be regarded as exaggerations of the normal. To this list a number of observers have added paranoid psychosis, a rare accompaniment, which is regarded by them as a development of sleep hallucinosis. Thus Brock and Wiesel (1941) state that the "psychosis is always a development of the sleep hallucinatory state". Drake (1949) similarly observes: "Rarely a chronic hallucinatory state seems to develop on the basis of the dream experience."

There have been many theories regarding the pathogenesis of "idiopathic" narcolepsy. They can be conveniently classified into four groups; these are not necessarily mutually exclusive:

1. That all forms of idiopathic narcolepsy are in fact symptomatic. Lesions of the mesencephalic and diencephalic areas in particular may produce typical narcolepsy or conditions closely allied to it, e.g. epidemic encephalitis (Adie, 1926), trauma (Gill, 1941), tumours (Davison and Demuth, 1945–1946). More recently the "reticular activating system" has been delineated and incriminated (Daly and Yoss, 1957). Certain metabolic disturbances acting through these centres or by some other mechanism may also produce the disease, e.g. hyperinsulinism (Delay, 1942).

2. That narcolepsy is closely related to epilepsy (Wilson, 1928; Cohn and Cruvant, 1944; Roth, 1946; Symonds, 1954). However, the great majority of narcoleptics show no real evidence of epilepsy (Pond, 1952; Daly and Yoss, 1957).

3. That Pavlovian concepts throw light on the narcoleptic symptoms. This view has been maintained by Adie (1926), Levin (1935, 1950, 1953) and Fabing (1945, 1946). These explanations, while perhaps not completely satisfying, have the merit of drawing attention to the role of the cerebral cortex in narcolepsy.

4. That idiopathic narcolepsy may represent a neurotic reaction to mental conflicts. This must be distinguished from the viewpoint that narcolepsy is influenced by the emotional state; all observers agree on this; only some feel that mental conflicts may be a necessary and sufficient cause of narcolepsy. The theories of psychogenesis are discussed briefly below.

It should be added finally that in some cases evidence of hereditary factors has been adduced (Krabbe and Magnussen, 1942; Hoff and Stengel, 1931; Cohn and Cruvant, 1944). Such cases appear to be the exception rather than the rule.

PHYSIOLOGICAL STUDIES

In symptomatic narcolepsy the laboratory data may reveal evidence of the underlying disease. In the idiopathic condition, however, the laboratory yield has been disappointingly meagre. The EEG is typically normal apart from showing evidence of sleep activity (Daly and Yoss, 1957). The B.M.R. is lower, on the average, when compared to a normal group (Daniels, 1934; Pond, 1952). The glucose tolerance was abnormal in six out of twelve cases described by Daniels and is considered to be frequently abnormal by Modlin and Scriver (1951). Autonomic disturbances have been reported by continental workers (Hoffmeister, 1948) but the evidence is not yet completely convincing and recently Roth and Simon (1955) were unable to demonstrate any relationship between the autonomic state of narcoleptics and sleep. Richter (1929) stated that skin resistance was high in narcoleptics. However this finding may have been non-specific; resistance was also found to be high in schizophrenic stupors. Daniels noted polyuria and polydipsia in a few cases, while one case with diabetes insipidus has been described (Modlin and Scriver, 1951). Daniels in a study of forty-four cases could not confirm the alleged frequency of relative lymphocytosis. Many observers have suspected endocrinal abnormalities but there has been no proof.

Psychopathological Studies

Interest in the narcoleptic-cataplectic syndrome by psychiatrists is quite recent. Benedetti (1953) estimated that out of two hundred dissertations on narcolepsy, only twenty touched on the psychopathological side of the problem. In 1934, Notkin and Jelliffe carried out their historic review. Using the term narcolepsy to cover other cases of hypersomnia not showing the full features of the narcolepsy-cataplexy syndrome, they distinguished five groups:

1. Those with a definite psychopathological background.
2. Those with definite cerebral involvement—e.g., brain tumours, trauma, arteriosclerosis, etc.
3. Those associated with chronic encephalitis.
4. Combined epilepsy and narcolepsy.
5. Cryptogenic, or idiopathic.

From the review, it appears that practically all cases in which cataplexy and narcolepsy are present together fall into the cryptogenic category. Their first group contains sixty-four cases out of a total of two hundred and seventy gathered from one hundred and forty-one publications between 1813 and 1931. They say of this group that it includes "Cases of hypersomnia and those of attacks of sleep in persons with a definite psychopathologic background. Those cases may not properly belong to the narcolepsies". Certainly such cases as the "sleeping Effie" of Edward (1848) would appear to be related to the psychotic stupors rather than to narcolepsy.

Daniels in his review of one hundred and forty-seven cases of narcolepsy mentions that while the disease presents the patient with many problems, it rarely results in pronounced personality deviations. However, he describes one girl of fourteen years who became psychotic two years after developing diurnal somnolence and terrifying nocturnal dreams. Her hallucinatory experiences began to persist during the day and she came to believe in their reality. There was some improvement with ephedrine sulphate. Another of his cases became irritable and suspicious and neglected her household duties. Daniels leaves the question open as to whether the psychosis associated with narcolepsy is a reaction of the personality to the illness or an extension of some common underlying organic process. The number of other cases of narcolepsy in which psychotic episodes have occurred is quite small according to the literature.

Such cases have been described by Brown (1908), Froderberg (1930), Thiele and Bernhardt (1933), Locke and Bailey (1940), Brock and Wiesel (1941), Lehrman and Weiss (1943), Drake (1949) and Quensel (1952). Possibly Morton's case (1884) should be included also. All the psychoses were of the paranoidal schizophrenic type, but Locke and Bailey were impressed by the unusual degree of insight shown by their case and questioned whether this was a true schizophrenic illness. Most of these psychoses appeared to develop by way of sleep hallucinosis, the vivid hallucinations eventually persisting into the daytime and attaining the status of reality. The case described by Lehrman and Weiss was atypical in this respect: the authors felt that the paranoid symptoms originated in the patient's self-consciousness regarding her attacks. Narcolepsy appeared prior to the psychosis in all these cases although in Locke and Bailey's case auditory hallucinations had been present fourteen years before the onset of narcolepsy.

In recent years, cases of "idiopathic" narcolepsy have been described in which the illness was felt to be a response to severe emotional conflicts. Sleep used as a resistance to analysis was discussed years ago by Ferenczi (1926) and in 1924, Missriegler analysed a case of morbid sleepiness successfully. (In this case, however, cataplexy was not present.) Missriegler, however, is careful to point out that there may have been an underlying post-encephalitic basis for the condition. In 1944, Langworthy and Betz published a paper based on six cases of "idiopathic" narcolepsy and suggested that the disease represented a personality reaction to emotional conflict and that these patients felt "caught in a life pattern to which they are expected to conform but which they deeply resent". Other papers supporting the importance of the psychogenic factors in narcolepsy have been presented by Myers (1920), Jones (1935), Murphy (1941), Spiegel and Oberndorf (1946), Davison (1945), Barker (1948), Deutsch and Murphy (1955) and Switzer and Berman (1956). The last-named authors summarize the evidence in favour of psychogenicity as follows:

1. Narcolepsy frequently begins at a stressful period in life—that is, in adolescence and early maturity. It could represent an attempt to escape those stresses.
2. The greater incidence (2:1) in men may be related to greater stresses on males.
3. The weight gain could be due to substitutive oral activity.
4. The great variation in the frequency of attacks.
5. The lack of abnormalities in the EEG.
6. The favourable response of the condition to mild stimulants.
7. The favourable response to psychotherapy.
8. The fact that Gelineau emphasized the importance of bolstering morale.

These arguments are all, of course, somewhat double edged. The clear relationship of narcolepsy and environmental stresses is not found at other "stressful" periods of life, e.g. the climacteric. It could be argued that women undergo as much stress as men. The weight gain (in case two for example) is often unaccompanied by any increase in appetite and is very sudden and striking. Great variation in frequency may occur in diseases which are probably not psychogenic, e.g., multiple sclerosis, epilepsy. An abnormal EEG is not an invariable concomitant of brain disease, even quite gross brain disease. Response to mild stimulants does not necessarily favour psychogenicity and in any case the narcoleptic frequently takes increasing doses of the stimulant (e.g. case two). At the present time, too few cases have been treated by psychotherapy for the effectiveness of this to be judged. Also these cases seem rarely to have been adequately followed up. It would be difficult to find any disease in which bolstering morale is not of value!

None of the arguments for or against organicity can be expected to be decisive until more information is available on the nature of the condition. What does seem clear from the review of the literature is that emotional conflicts do affect the manifestations of the condition and the individual's ability to cope with it. The effect of the emotional state of the individual on the condition is particularly obvious in cataplexy (Levin, 1953) but not infrequently actual sleep attacks can be produced by strong emotion (e.g. in the original case of Gelineau, 1880; also in those of Kahler, 1922; Westphal, 1877; Adie (case 2), 1926 and others). The effect of discussing conflictful material on the sleep attacks has been studied particularly in the interesting report of Barker (1948). Barker found that when strong aggressive feelings were aroused sleep attacks tended to intervene.

Case Reports

The two cases to be presented in this paper show pronounced psychological difficulties in addition to narcolepsy. Case 1 showed a definite paranoid schizophrenia and adds another to the small number of cases in the literature. Case 2 showed a neurotic character disorder with paranoid trends. Both displayed "narcolepsy" and "cataplexy" and in neither case was any organic lesion discovered although in Case 2 the illness had followed closely on an attack of "influenza". In addition to their psychological disturbances, they showed some interesting physiological changes.

Case 1

On 30 November, 1955, a twenty-seven year old stenographer, Jean M., was admitted to the Psychiatric Department of the University Hospital, Saskatoon. She had spent the previous six months in the Psychiatric Ward of another general hospital and had received six electro-shock treatments, superficial psychotherapy and largactil. The diagnosis made there was one of paranoid schizophrenia of very recent onset. In addition, she had shown typical features of the narcoleptic-cataplectic syndrome for seven years. For the latter condition, she had been receiving amphetamine sulphate, 5 mg. t.i.d. It was felt that her paranoid schizophrenia had failed to respond to the treatment given.

The patient was a pleasant, well groomed and superficially composed young lady. She smiled frequently and very blandly and at times her smile was quite inappropriate, for example, in discussing her sexual hallucinations, which she claimed she found intensely unpleasant. She showed little concern regarding the future and was herself perturbed by her lack of interest in what happened. She made contradictory statements regarding her hallucinations, saying that the voices she heard were the results of an illness but adding a few minutes later that she suspected a man of her acquaintance of being responsible. These hallucinations were mainly auditory and tactile in character but, in addition, she had from time to time visual and olfactory hallucinations.

The history was obtained from the patient and her relatives. There had been no family history of mental illness although the patient's mother was described as being rather "nervous", while the father and an aunt suffered from "nightmares" but otherwise appeared well adjusted. Jean was the fourth of a sibline of five. During the first few years of her life, she developed normally showing none of the so-called neuropathic traits. At the age of six, she developed involuntary micturition precipitated by emotion. She became extremely sensitive about this and would hide when strangers came into the house. Later, she had to wear pads to protect herself from public embarrassment. She did not suffer from nocturnal enuresis. As she grew older, she avoided mixed company. She herself gave no reason for this. Her sister suggested that it arose from her shyness and self-consciousness over her handicap. She was a conscientious and steady worker at school, completing grade twelve without difficulty. She then left home, took a business course, gained high marks and obtained a job as a stenographer. She proved a skilful and meticulous worker, always paying attention to details, which indeed she had always been noted to do since her early school days. Her work level was maintained until the end of December, 1954, when her psychotic illness appeared in overt form.

In 1948, she had developed the typical features of narcolepsy and cataplexy and the arrival of these two symptoms was followed by the disappearance of her involuntary micturition. She became troubled by nightmares and these grew more severe as the years passed. The narcolepsy and cataplexy on the other hand were well controlled by amphetamine sulphate, 5 mg. t.i.d. In 1951, she was having frequent nightmares and was afraid of the dark but was otherwise cheerful and well according to her friends. A year later, her nervousness had increased and she was sleeping badly. She went on holiday to her sister's home in 1952 and there she began to complain of mice getting into her bed at night. She would actually see and smell them and would frequently remake the bed during the night. At that time, she also complained of hearing men's voices during the night. In the daytime, she appeared normal except for some nervousness. After a few weeks with her sister, she left for home. She continued to have vivid nightmares but did not mention hallucinations again until December of 1954. At this time, her illness broke out openly. She heard voices by day and by night, accusing her of sexual misdemeanours and became increasingly withdrawn and preoccupied. She suspected men of following her and of spying on her. They seemed to be criticizing everything she did, including her manner of dress, behaviour, appearance, etc. Later she began to feel someone having intercourse with her in bed. She stated that people were masturbating over her clothing and possessions. She became suspicious of her girl friend whom she had known for twenty-two years, and accused her of having sexual relations with a man in her bedroom. This girl was shocked by the change in Jean's mental state. The voices increased steadily in intensity until she began to have long conversations with them. They were usually the voices of people whom she knew at work and were almost invariably men's voices. The "sexual attacks" increased also and she began to wear slacks at night in order to have some protection. Eventually she left her job, went home and would ask her parents to sleep with her because of the frequency of the "assaults". As before, she was most troubled at night but even during the day she would frequently hear unpleasant remarks usually of a sexual nature concerning herself. Her parents were now alarmed and because of this sought psychiatric advice which led to her admission first to the psychiatric ward of a general hospital and then to her transfer to the University Hospital, Saskatoon.

Progress

On admission, she showed disturbance of volition, association and affect and spoke freely of her auditory hallucinations. She displayed, in fact, the typical features of paranoid schizophrenia, but it was noted that she made better contact than the usual patient and also that, for the most part, she was remarkably detached and objective about her hallucinations. An attempt was made to treat her by superficial psychotherapy. This was difficult. There had been some memory loss following the previous course of E.C.T. and she maintained a peculiarly bland attitude towards her illness and was unwilling to talk about herself and her problems before it began. It was apparent that she had never had any sexual education, the family being somewhat prudish about such matters, but, on the other hand, her siblings had shown no difficulty in making adequate sexual adjustment. No evidence of definite trauma in early life was elicited. The parents were rather proud and somewhat meticulous people, but their relationship with the girl seemed a sound one and the siblings seemed particularly mature and well-adjusted people.

It was difficult to obtain from her the full details as to when her illness really began. This was partly due to the slight amnesia following E.C.T. It was clear, however, that the first symptoms of her disturbance had appeared at night, in the form of nightmares which persisted into the waking state and throughout her illness, it was apparent that the symptoms tended to be intensified at night.

Amphetamine was discontinued, but there was no amelioration of the psychosis. It was then decided to give her an additional course of electro-convulsive therapy and, in addition, to put her on niacin, gr. 1 t.i.d., which has been reported by Hoffer *et al.* (1957) as being of marked value in cases of acute schizophrenia. She received six electro-shock treatments in all on this occasion. Towards the end of her stay, she was put on frenquel, 40 mg. t.i.d., as this had been reported as being of benefit in schizophrenia. During her stay in hospital, there was a slow improvement in her mental condition, the voices remaining but becoming less troublesome and her concentration improving. She continued to have occasional narcoleptic and cataplectic attacks in hospital but no definite relationship of these to stress was discovered. However, it was noticed that the cataplectic attacks increased in frequency at a time when she was impatient to leave the hospital but did not care to express this to her physician; this might, of course, have been coincidental. Her work in the occupational therapy department showed steady improvement and by the end of her stay she was able to carry out stenographic work satisfactorily. She was discharged from hospital on 10 March, 1956 and after a short holiday obtained a job as a stenographer in another town.

It was possible to have her followed up satisfactorily by a psychiatric social worker. She continued to take the niacin and frenquel for six months after leaving hospital and then decided that she did not require them and discontinued both. A year and a half after leaving hospital, she is reported to be functioning well but is still hearing voices daily although they remain much less troublesome than initially. She is able to ignore them and to work steadily, and her physical health is good. She is sleeping soundly and, interestingly enough, her cataplexy has disappeared, while her "sleeping spells" continue but are so mild that she does not have recourse to amphetamine sulphate.

Comments on Case 1

In this girl, the paranoid schizophrenic break seems to have developed out of the vivid nightmares. The pre-psychotic picture shows a shy sensitive person who had denied any conscious interest in the opposite sex. The hallucinatory psychosis appears to assume a compensatory and perhaps wish-fulfilling function. Hallucinations are in the auditory sphere chiefly but are also visual, tactile and olfactory. As in Locke and Bailey's case, the patient shows more insight than is commonly found in schizophrenia but otherwise the picture is unmistakably what would be classified as schizophrenia in the present state of our knowledge. It is interesting that the narcolepsy and cataplexy were well controlled while the nightmares and then the psychosis increased in intensity.

The results of the physiological tests are discussed separately below.

Case 2

The patient, Kenneth R., aged thirty-six years was admitted to the University Hospital in March, 1957. There was a history of the narcoleptic-cataplectic syndrome of eighteen years' duration. During the past nine years he had been under intermittent psychiatric treatment for "depression", instability, a profound sense of frustration and occasional outbursts of rage.

The patient was born six weeks prematurely on a farm. He weighed five and a half pounds at birth and was said to be "black and blue". He experienced some feeding difficulty and when he was a few weeks old his mother developed pleurisy. He was his parents' first child and they had great hopes for him. Just over a year later, a second son was born completing the family.

The parental background was interesting. The paternal grandfather came to England from Germany in the 1870s. He was described as an unstable man and an "alcoholic". He married unhappily; his wife, the paternal grandmother, was a rigid, eccentric woman who became overtly psychotic during her sixties and spent the last twenty years of her life in a mental hospital. Years before she was hospitalized, she would write the patient's parents signing herself "The Countess". Kenneth's father had an unhappy childhood. There was much dissension in the home while at school he was scorned by other boys because he was a "German". He grew up with a chronic sense of inadequacy and resentment and this was increased by repeated occupational failures. Kenneth's mother was four years older than his father and apparently represented a protective figure to him. She had come from a somewhat higher social stratum and before marriage was a children's nurse.

The marriage of Kenneth's parents was not a happy one. His father farmed in Canada and met with frustration and failure. He showed resentment to his wife and was scornful of the children, calling them "sissies names" and making them feel inferior. The mother turned increasingly toward the children, assuming an over-protective role and cherishing great ambitions for them. She used to tell them in childhood that she wished them to become "professional men".

The patient and his brother were very close emotionally. Both were "delicate and fragile", and were "brought up like little Englishmen". This as might be expected did not help them to fit into life on the Canadian prairies. They were derided by other boys because of their accent and manners. They were exceedingly naïve sexually and thought that "children came from Gentle Jesus" and they were repeatedly humiliated by other boys because of this. On one occasion, and there were many such, Kenneth was held down by a girl while her brother made his younger brother eat manure. Kenneth was not surprisingly a shy, insecure and resentful boy. He suffered from recurrent nightmares and somnambulism and he grew up with strong ambitions for himself.

In adolescence he felt, if anything, even more insecure, especially in a sexual sense. He never had a girl friend although he claims he felt interested in girls. There were a number of reasons for this; he lacked both social skills and sexual knowledge and he was particularly sensitive to humiliation and rejection. In addition, the family was poor and he had no money with which to take out girls. He compensated to a considerable extent by working hard at school, but he had difficulties here also (despite an I.Q. of 127) because he was taught one thing at home and another thing at school. Thus he was taught one style of writing by his mother and another by the teacher and he found it very difficult to make a compromise.

In the spring of 1939 when he was nineteen years old and was in grade twelve, he developed "influenza". A few weeks afterwards, he noticed he would become increasingly sleepy. He also started having attacks of weakness. When overcome by some strong emotion, he would just fall to the ground in a flaccid heap. There was also a personality change which he called "a change of nature", and he became increasingly dull, depressed and irritable. Extensive neurological investigations then and subsequently disclosed no evidence of encephalitis. Between 1940 and 1941, he gained over seventy pounds in weight without noticing any increase in appetite. At the end of 1941 his brother died of pneumonia while serving in the Air Force and Kenneth's loneliness was increased. He, himself, was not accepted for the services because of his illness and he continued to work at home on the farm. This gave the family fair financial support. In 1946, he began to notice a peculiar "indisposition". He would feel powerless to move although he wanted to. He emphasized, however, that it was a disturbance of volition and not a true paralysis. In 1948, because of his depression, irritability and failure to work efficiently on his parents' farm, he consulted a psychiatrist. Previously, he had taken up to sixty or seventy mg. of amphetamine sulphate per day without benefit. Between 1948 and 1952, he was treated by frequent psychotherapeutic interviews in an attempt to enable him to cope more adequately with his problems. During this time, he made an attempt at independence by seeking a job in Regina and supporting himself for a few months. But the improvement did not last and in 1952 he was admitted to the Psychiatric Ward of a general hospital because he felt deeply unhappy about himself and his illness. There he began to feel that he was being neglected. One incident upset him greatly. He confided in a student nurse whom he liked. Later he found that her brother was suffering from schizophrenia and had been admitted to the same ward as himself. He became extremely critical of the staff for allowing a relative of a nurse to be admitted to a psychiatric ward and his manner became increasingly truculent and aggressive. Eventually, he said, he discovered that the nurse whom he had confided in was having an affair with another patient. He apparently felt rejected and in a fit of rage broke all the windows of the sitting room. His conduct had now become so difficult to control that it was decided to transfer him on two medical certificates to the local mental hospital. He remained there for ten months and apparently preferred it, claiming that he had more status there, that the rules were more consistent and reasonable and that his condition appeared to be better understood. He did, however, exhibit peculiar ideas at this time believing for example at one time that he was to be castrated for his narcolepsy. However, close inquiry showed that a patient with similar symptoms had undergone an operation for an unrelated testicular condition. On another occasion, he claimed the staff were ill-treating an elderly patient and struck two female nurses. His behaviour at this time was considered to be quite paranoidal, and on his discharge from the mental hospital the clinical director, a man of wide experience, expressed an opinion that he might be suffering from paranoid schizophrenia. A careful perusal of the records shows however that there is no solid and unequivocal evidence to establish this diagnosis and it seems that the paranoidal features as exhibited were more the manifestations of a neurotic character disorder. This view is substantiated by the results of the Rorschach examination which was carried out then.

He returned to the farm in the summer of 1953 and remained essentially unchanged though perhaps rather more resigned to his condition. Because of the large dosage of dexedrine which he was once again taking, he decided to inquire if anything more could be done for his narcolepsy. As a result, he was referred to the Neurology Department of the University Hospital, Saskatoon, in February, 1957. He was transferred to the Psychiatric Department two weeks later for assessment.

He was treated by superficial psychotherapy and desoxyn 5 mg. b.i.d. which had been substituted for dexedrine. A number of investigations were carried out and are detailed below. He proved to be a deeply insecure man with neurotic paranoid trends and was preoccupied with feelings of humiliation, rejection and inferiority. He showed defensive grandiose trends. It was felt that his ego structure was rather weak and that uncovering psychotherapy might well precipitate a serious breakdown. His age and life situation would have made it difficult to effect any radical change in his character structure. It was quite evident that he had exhibited severe problems long before the onset of his narcolepsy but it was felt that the illness had greatly aggravated these trends. He did gain some relief from brief psychotherapy, talking freely about himself and his problems but seeking to dominate the interviews. It was evident that his feelings toward his mother and brother had been deeply ambivalent while he was frankly hostile to his father. He ventilated many feelings of hostility, inadequacy and inferiority. He had always felt a deep insecurity especially in a sexual sense and had compensated for this by grandiose plans. His difficulties were greatly intensified when the narcolepsy appeared. While the illness permitted an honourable withdrawal and dependency on his parents, it did not, of course, satisfy his needs for achievement and adequacy.

His symptoms diminished markedly while he was on the ward but he continued to take odd "naps" during the day and at times was aware of an indisposition to do anything. His sleepiness was markedly affected by external stimuli. Thus when he conversed with someone he liked he was notably brighter and more alert, though he would invariably have a bout of sleepiness at some time during the day. Discussion of emotionally disturbing material, however, did not appear to precipitate an attack.

He was discharged on 15 April, 1957. He had previously stated that he would feel worse at home. A few weeks later his mother had to write two letters for him because of his "indisposition". Yet while in hospital he had been able to write voluminously. The letters stated that he was finding it very hard to work on the farm.

Comments on Case 2

In this case, there were severe difficulties of adjustment prior to the onset of the narcolepsy. The patient felt emotionally isolated and inadequate. He found it difficult to identify with the masculine role, and his relationship with his father and his schoolmates greatly increased this problem. The narcolepsy increased his difficulties of adjustment, accentuating the neurotic character trends and making it more difficult for him to follow the maturing process. As a result, he became almost wholly dependent on his parents while bitterly resenting this dependence. He adopted a grandiose irritable manner and rejected attempts to help him find a job commensurate with his abilities. Indeed with an I.Q. of 127 and a deep need to achieve something outstanding on the one hand and his emotional disturbance and narcolepsy on the other, a satisfactory solution of the problem was impossible.

As has been mentioned, it was felt that uncovering psychotherapy might increase rather than diminish his problems. Instead, an attempt was made to help him adjust to his handicap at a superficial level. He developed a strong dependent transference not unmarked, as might be expected, by deep ambivalence.

PHYSIOLOGICAL AND PSYCHOLOGICAL INVESTIGATIONS

Routine examinations of blood, urine and basal metabolism showed no abnormality.

EEG Studies

The EEG examinations were carried out on a Grass Model 3D eight-channel apparatus. For the parallel E.C.G. examinations, standard lead III was used.

Both cases showed the characteristic short bursts of drowsy EEG activity; there was no evidence of any other abnormality.

When given insulin intravenously, both patients showed remarkable psychological and EEG changes. Hoffer (1957) has been studying the effects of hypoglycaemia on the EEG in an effort to study homeostatic mechanisms. One unit of insulin is given i.v. per eight pounds of body weight. Usually, but not invariably (Ziegler and Presthus, 1957), there is a tendency for slow wave activity to appear (Wyke, 1952). In Case 1, the blood glucose fell over 45 minutes to 38 mg. per 100 ml. During this time, the patient became more alert and the EEG patterns tended to normalize, the sleep activity diminishing. In Case 2, blood glucose fell to 39 mg. per 100 ml. Once again, the patient became more alert and the EEG pattern showed diminished sleep activity. In both cases, drowsiness returned a few seconds after 50 ml. 33 per cent. intravenous glucose was given. The increased alertness with hypoglycaemia was most striking and no clouding of consciousness was present. The EEGs for Case 1 are shown in Figures 1–4. The blood-glucose levels are indicated.

Glucose Metabolism

The Exton Rose Glucose Tolerance Test was used with the following results. These results, being unusual, were checked carefully.

		Case 1 Blood Glucose mg./100 ml.	Case 2 Blood Glucose mg./100 ml.
8.45 a.m.	(fasting)	156	97
9.00 a.m.	50 gm. glucose given		
9.30 a.m.		133	134
	50 gm. glucose repeated		
10.00 a.m.		82	172
12.00 a.m.		116	113
2.00 p.m.		113	62

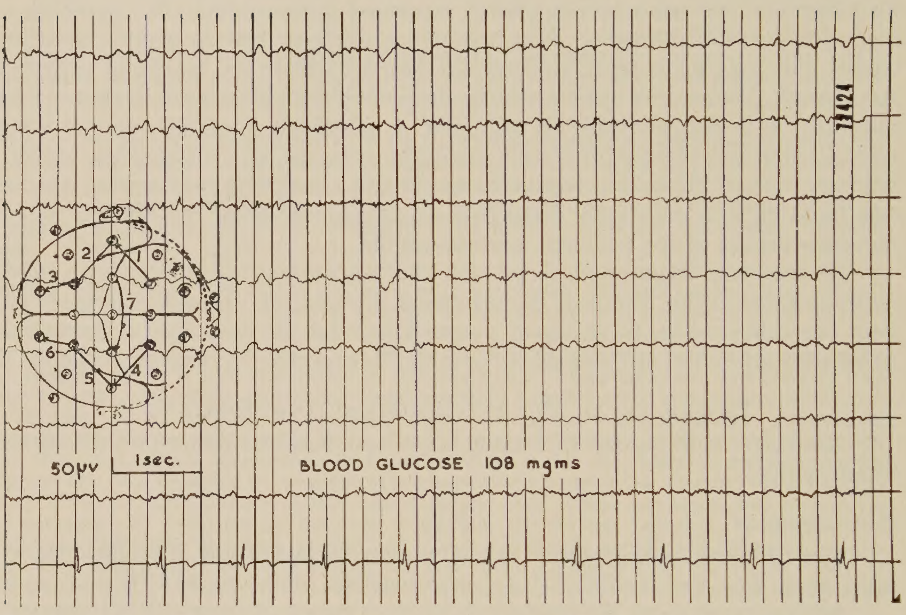

77424
2
1
3
7
6
5
4
50µV
1sec.
BLOOD GLUCOSE 108 mgms

FIG. 1.—EEG on Case 1 immediately prior to injection of 17 units soluble insulin I.V. Time: 8.45 a.m. Note considerable drowsy pattern. Blood glucose level is 108 mg./100 ml.

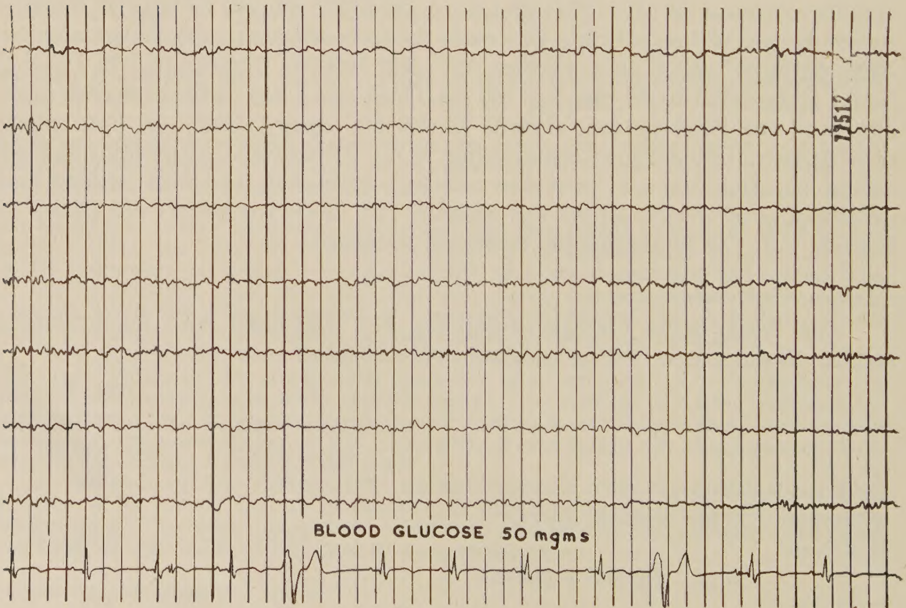

77512
BLOOD GLUCOSE 50 mgms

FIG. 2.—Case 1. Leads as in figure 1. Time: 9.10 a.m. Blood glucose 50 mg. There is a little drowsiness.

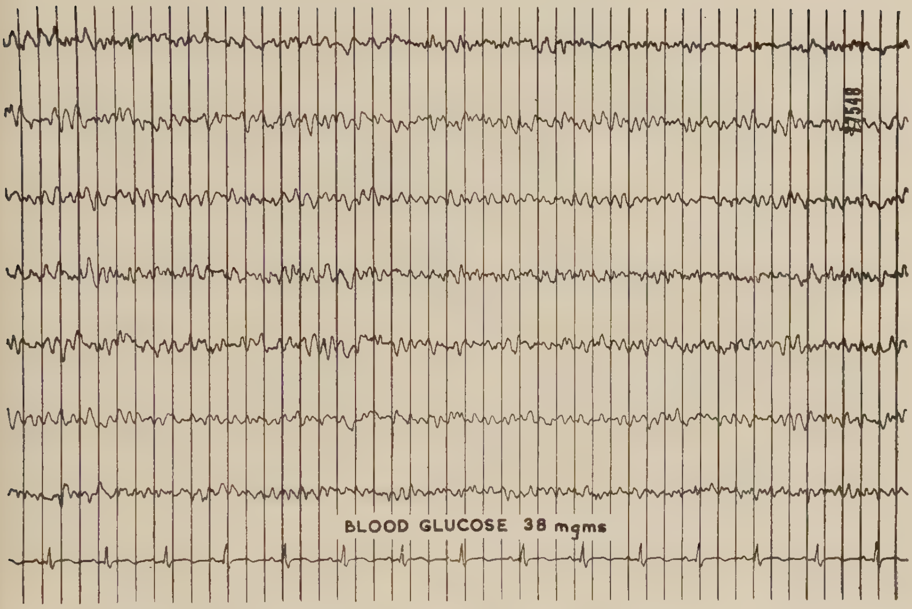

17548
BLOOD GLUCOSE 38 mgms

FIG. 3.—Case 1. Leads as in figure 1. Time: 9.25 a.m. Blood glucose is now 38 mg. There is very little drowsiness and alpha activity appears fairly well maintained.

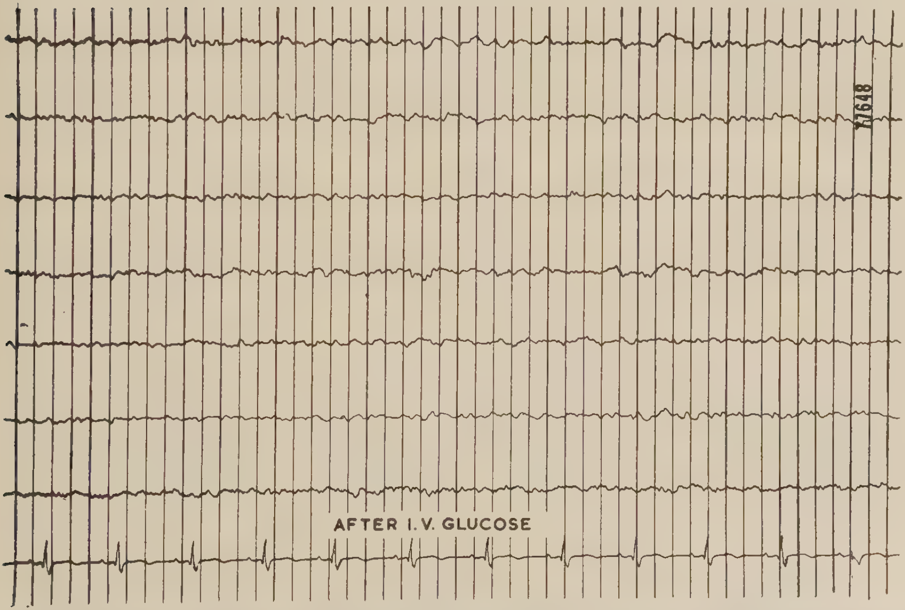

17648
AFTER I.V. GLUCOSE

FIG. 4.—Case 1. Leads as in figure 1. Time: 10.0 a.m. 50 c.c. of 33 per cent. glucose has been given I.V. The drowsy pattern is markedly increased.

Response to Autonomic Drugs (1954)

Hoffer in studying the effect of para-sympathetic activity on sleep has been using the following combination of drugs: atropine, 3 mg. i.m. followed by physostigmine, 2 mg. i.m. one half hour later; finally 200 mg. acetylcholine is given i.v. after a further 15 minutes. After the injection of acetylcholine, the subject may often feel sleepy and show sleep activity on the EEG. The results in the two subjects were not striking though they both reported some slight increase in alertness following acetylcholine.

Both subjects were given Funkenstein's mecholyl test. Neither re-established homeostasis in 30 minutes. Case 1 showed a "hyper" type of reaction (but the E.C.T. given a few weeks previously may have affected this result). Case 2 showed a "hypo" reaction, the blood pressure remaining below the initial base line.

Methedrine, 30 mg., was given on a separate occasion to Case 1. A striking activation of the psychosis occurred and subsequently auditory hallucinations bothered her all night. Case 2 was given adrenaline by inhalation. He claimed that the drug relieved his drowsiness for about one hour but to produce this effect he had to inhale 500 micrograms. He was also, on another occasion, given 1 mg. of physostigmine salicylate intramuscularly; this made him feel sick but had no effect on his drowsiness.

Psychological Investigations

The report of the Rorschach examination on Case 1 (Mr. W. J. Craig) stated: "This is a schizophrenic type of record. Scoring in Piotrowski's (1950) objective manner, five signs of C.N.S. disorder are found. Score for formula alpha was three and the test was within validation limits indicating schizophrenia rather than neurosis. Of the four signs differentiating schizophrenia from organic conditions, the patient has two favouring schizophrenia. The prognostic indication gave a score of five which predicts little change or perhaps some improvement in the schizophrenic condition over the next three years." It was felt that the E.C.T. previously given would account for the organic signs. The M.M.P.I. yielded the following profile:

Scale	L	F	K							
Raw Score	5	4	15							
Scale	Hs	D	Hy	Pd	Mf	Pa	Pt	Sc	Ma	Si
T Score	50	77	57	43	55	70	78	74	40	78

The Rorschach report (Mr. W. J. Craig) on Case 2 was as follows: "This patient has adequate control but shows depression and anxiety plus considerable fluctuation in mood. He prefers life to be well organized and secure and in this setting would like a dependent role. He is uncertain of his masculinity and his father relationship is seen as hostile." The M.M.P.I. profile obtained was:

Scale	L	F	K							
Raw Score	2	10	12							
Scale	Hs	D	Hy	Pd	Mf	Pa	Pt	Sc	Ma	Si
T Score	59	94	71	66	61	56	80	96	58	48

DISCUSSION

In both cases, the illness had had striking repercussions on the life of the patient. In Case 1, adjustment before the illness was somewhat precarious, the personality showing obsessional trends and sexual feelings being denied. When the psychotic illness developed, apparently as an extension of the sleep hallucinosis, the content consisted of material which had never gained conscious expression. In Case 2, the previous adjustment was poor and the illness facilitated regressive trends already present. This patient's desire for independence, maturity and achievement remained unsatisfied, however, and severe conflict remained.

The question arises, of course, whether the narcolepsy arose solely as a response to the pre-existing conflicts. While this cannot be answered definitively, there are a number of points against a purely psychogenic aetiology. The results of the physiological data suggest some underlying metabolic dysfunction. The peculiar alerting response to hypoglycaemia is quite unusual. Excitement is, of course, common with hypoglycaemia, increased alertness is not; in fact, hypoglycaemia on occasion has simulated narcolepsy (Delay, 1942). It has been suggested that narcolepsy is a reversible disturbance of the reticular activating system (Daly and Yoss, 1957) and it is interesting to note that the reticular system contains components sensitive to acetylcholine (Rinaldi and Himwich, 1955a, 1955b) and adrenaline (Rothballer, 1956). A possible explanation of the alerting effect with hypoglycaemia could be a central liberation of adrenaline with stimulation of the adrenaline sensitive part of the reticular activating system. A disturbance of this system might also explain the beneficial effect of the sympathomimetic drugs in narcolepsy. Another possibility is that the rise in free glutamate which occurs in hypoglycaemia (Himwich and Sullivan, 1956) may have an ameliorating effect on the narcolepsy. The atypical responses to the Exton Rose Test also suggest that factors other than psychological are implicated. Again, the sudden marked gain in weight (without increase of appetite) in Case 2 would be consistent with involvement of the hypothalamic brain stem region. Finally, if the sleep attacks are regarded as ego defensive manoeuvres, the question still arises as to how this particular defence comes to be selected. So far, purely psychological studies have shed no light on this problem.

There are additional general considerations which would favour the existence of some underlying organic disturbance. First of all, the characteristic short bursts of drowsy activity seen on the EEG often come and go suddenly without any apparent relation to stress. This was certainly true in both the cases described. Secondly, skilled clinicians with wide experience of narcolepsy have not been struck by the neurotic trends of these patients (Adie, 1926, 1930; Cave, 1931; Daniels, 1934) and it is possible that the cases reported by psychiatrists may represent a biased example of the total narcoleptic population. Thirdly, other features suggestive of hypothalamic involvement have often been reported in narcolepsy (sudden changes in weight, hypogenitality, disturbance of carbohydrate metabolism, etc.). Fourthly, it may be pointed out that in the psychosomatic disorders, it is usually held that, in addition to the conflicts involved, some specific additional factors must be invoked (Alexander, 1952); similar considerations would apply to narcolepsy.

Psychological factors are certainly relevant however to the expression of the condition. This is obvious enough in relation to the cataplexy and also frequently to the attacks of sleepiness, as was observed previously. It has been noted repeatedly too that factors normally producing boredom and fatigue in normals act with increased force in narcoleptics inducing attacks of somnolence. Finally, it is clear that the illness may present the patient with serious problems of adjustment to his altered function and role and that psychotherapy may be indicated.

The relationship of the psychosis which rarely develops in narcolepsy to schizophrenia must remain obscure while so little is known about both disorders. It appears, however, as if the psychosis may either develop in intimate connection with the sleep hallucinosis (the more common way) as in Case 1 or else independently and perhaps fortuitously.

SUMMARY

The literature relating to narcolepsy and associated emotional disturbance is briefly reviewed. The rarity of associated overt psychosis is pointed out.

Two cases of idiopathic narcolepsy are then presented. The illness in the first case was accompanied by paranoid schizophrenia, in the second by a neurotic character disorder.

Unusual neurophysiological findings are presented. The chief of these was a marked increase of alertness following hypoglycaemia. The possible significance of this and other findings is discussed.

Finally, it is suggested that psychological factors have a modifying influence in the narcoleptic phenomena but probably do not act as a necessary and sufficient cause of narcolepsy. The importance of psychotherapy in some cases is stressed.

ACKNOWLEDGMENTS

My thanks are due to Dr. A. Hoffer, Dr. A. A. Bailey, Mr. R. A. Schneider and Mr. W. J. Craig, for their help and encouragement. Responsibility for the views expressed is, of course, my own.

REFERENCES

1. ADIE, W. J., *Brain*, 1926, **49**, 257.
2. *Idem*, *Practitioner*, 1930, **125**, 288.
3. AIRD, R. B., GORDON, N. S., and GREGG, H. C., *A.M.A. Arch. Neurol. Psychiat.*, 1953, **70**, 510.
4. ALEXANDER, F., *Psychosomatic Medicine*, 1952. London: Allen and Unwin.
5. BARKER, W., *Psychosomat. Med.*, 1948, **10**, 193.
6. BENEDETTI, G., *Mschr. Psychiat. Neurol.*, 1953, **126**, 125.
7. BROCK, S., and WIESEL, B., *J. Nerv. Ment. Dis.*, 1941, **94**, 700.
8. BROWN, R. D., *J. Ment. Sci.*, 1908, **54**, 107.
9. CAVE, H. A., *A.M.A. Arch. Neurol. Psychiat.*, 1931, **26**, 50.
10. COHN, R., and CRUVANT, B. A., *A.M.A. Arch. Neurol. Psychiat.*, 1944, **51**, 163.
11. DALY, D. D., and YOSS, R. E., *Proc. Staff Meet. Mayo Clin.*, 1956, **31**, 620.
12. *Iidem*, *EEG Clin. Neurophysiol.*, 1957, **9**, 109.
13. DANIELS, L. E., *Medicine*, 1934, **13**, 1.
14. DAVISON, C., *Psychiat. Quart.*, 1945, **14**, 478.
15. *Idem* and DEMUTH, E., *A.M.A. Arch. Neurol. Psychiat.*, 1945, **53**, 399; 1945, **54**, 241; 1946, **55**, 111; 1946, **55**, 126; 1946, **55**, 364.
16. DELAY, J., *Ann. Méd. Psychol.*, 1942, **100**, 375.
17. DEUTSCH, F., and MURPHY, W. F., *The Clinical Interview*, 1955. Vol. 1. New York: I.U.P.
18. DOYLE, J. B., and DANIELS, L. E., *J.A.M.A.*, 1931, **96**, 1370.
19. DRAKE, F. R., *Amer. J. Med. Sci.*, 1949, **218**, 101.
20. DYNES, J. B., *J. Nerv. Ment. Dis.*, 1943, **98**, 48.
21. EDWARD, J., *Lancet*, 1848, *i*, 309.
22. FABING, H. D., *A.M.A. Arch. Neurol. Psychiat.*, 1945, **54**, 367; 1946, **55**, 353.
23. FERENCZI, S., "Falling Asleep During the Analysis" in *Further Contributions to Psychoanalysis*, 1926. London: Hogarth Press.
24. FRODERBERG, H., *Hygeia*, 1930, **92**, 788.
25. GELINEAU, —., *Gaz. des Hôp., Paris*, 1880, **53**, 626.
26. GILL, A. W., *Lancet*, 1941, *i*, 474.
27. HIMWICH, W. A., and SULLIVAN, W. T., *J. Nerv. Ment. Dis.*, 1956, **124**, 21.
28. HOFF, H., and STENGEL, E., *Klin. Woch.*, 1931, **10**, 1300.
29. HOFFER, A., Personal communication, 1957.
30. *Idem*, *J. Nerv. Ment. Dis.*, 1954, **119**, 421.
30a. *Idem, et al.*, *J. Clin. Ex. Psychopathol.* 1957, **18**, 131.
31. HOFFMEISTER, M., *Schweiz. Arch. Neurol. Psychiat.*, 1948, **62**, 96.
32. JONES, M. S., *J. Neurol. Psychopath.*, 1935, **16**, 130.
33. KRABBE, E., and MAGNUSSEN, G., *Acta. Psychiat. et Neur.*, 1942, **17**, 149.

34. Kahler, H., *Jahrb. f. Psychiat. u. Neurol.*, 1922, **41**, 1.
35. Langworthy, O. R., and Betz, B. J., *Psychosom. Med.*, 1944, **6**, 211.
36. Lehrman, S. R., and Weiss, E. J., *Psychiat. Quart.*, 1943, **17**, 135.
37. Levin, M., *A.M.A. Arch. Neurol. Psychiat.*, 1929, **22**, 1172.
38. *Idem*, *J. Neurol. Psychopath.*, 1935, **15**, 236.
39. *Idem*, *J. Nerv. Ment. Dis.*, 1950, **111**, 101.
40. *Idem*, *A.M.A. Arch. Neurol. Psychiat.*, 1953, **69**, 224.
41. Lhermitte, J., and Tournay, A., *Rev. Neurol.*, 1927, **1**, 751.
42. Locke, W., and Bailey, A. A., *Proc. Staff Meet. Mayo Clin.*, 1940, **15**, 491.
43. Missriegler, A., *Fortschr. d. Sexualwiss. u. Psychoanalyse*, 1924, **1**, 215. (Trans.: Karpman B., *J. Nerv. Ment. Dis.*, 1941, **93**, 141.)
43a. Modlin, H. C. and Scriver, W. de M., *Ann. Int. Med.*, 1951, **35**, 710.
44. Morton, W. J., *J. Nerv. Ment. Dis.*, 1884, **11**, 615.
45. Murphy, W. F., *Amer. J. Psychiat.*, 1941, **98**, 334.
46. Myers, C. S., *Lancet*, 1920, *i*, 491.
47. Notkin, J., and Jelliffe, S. E., *A.M.A. Arch. Neurol. Psychiat.*, 1934, **31**, 615.
48. Osler, W., (Ed.) *Modern Medicine*. Vol. VII. New York: Lea and Febiger, 1910
49. Piotrowski, Z. A., and Lewis, N. D. C., *Amer. J. Psychiat.*, 1950, **107**, 360.
50. Platania, S., and Mancini, G., *Acta Neurol.* (*Napoli*), 1955, **10**, 78.
51. Pond, D. A., *J. Ment. Sci.*, 1952, **98**, 595.
52. Prinzmetal, M., and Bloomberg, W., *J.A.M.A.*, 1935, **105**, 2051.
53. Quensel, F., *Nervenarzt*, 1952, **23**, 307.
54. Redlich, E., *Ztschr. f. d. ges Neurol. u. Psychiat.*, 1925, **95**, 256.
55. *Idem*, *ibid.*, 1931, **136**, 128.
56. Richter, C. P., *A.M.A. Arch. Neurol. Psychiat.*, 1929, **21**, 363.
57. Rinaldi, F., and Himwich, H. E., *ibid.*, 1955, **73**, 387; 1955, **73**, 396.
58. Riser, —., and Dardenne, —., *Bull. et Mem. Soc. Méd. des Hôp. de Paris*, 1946, **62**, 413.
59. Roth, B., and Simon, J., *Neurol. Psychiat. C.S.L.*, 1955, **18**, 127.
60. Roth, N., *Bull. Menn. Clin.*, 1946, **10**, 160.
61. Rothballer, A. B., *EEG Clin. Neurophysiol.*, 1956, **8**, 603.
62. Spiegel, L. A., and Oberndorf, C. P., *Psychosomat. Med.*, 1946. **8**, 28.
63. Switzer, R. E., and Berman, A. D., *Ann. Int. Med.*, 1956, **44**, 938.
64. Symonds, C. S., *Canad. M.A.J.*, 1954, **70**, 621.
65. Thiele, R., and Bernhardt, H., *Abhandlungen a. d. Neur. u. Psych.*, 1933, **69**, 1.
66. Weitzner, H. A., *A.M.A. Arch. Neurol. Psychiat.*, 1952, **68**, 835.
67. *Idem*, *Permanente Found. Med. Bull.*, 1952, **10**, 153.
68. Westphal, C., *Arch. f. Psychiat.*, 1877, **7**, 631.
69. Wilson, S. A. K., *Brain*, 1928, **51**, 63.
70. *Idem*, *J. Neurol. Psychopath.*, 1933, **14**, 45.
71. Wyke, B. D., *EEG Clin. Neurophysiol.*, 1952, **4**, 339.
72. Ziegler, D. K., and Presthus, J., *ibid.*, 1957, **9**, 523.

CONFIRMATION OF OBJECTIVE TEST FACTORS AND ASSESSMENT OF THEIR RELATION TO QUESTIONNAIRE FACTORS: A FACTOR ANALYSIS OF 113 RATING, QUESTIONNAIRE AND OBJECTIVE TEST MEASUREMENTS OF PERSONALITY

By

IVAN H. SCHEIER

and

RAYMOND B. CATTELL

The Laboratory of Personality Assessment and Group Behavior
The University of Illinois

INTRODUCTION

CATTELL's basic strategy in personality research has been first to establish personality factors for each of three major types of measurement, rating (Life-Record), questionnaire (Self-Rating), and objective tests*, then to compare factors from one realm with factors from another (7). A factor in any one realm is established in the first place by being replicated. As Cattell says (4, p. 291): "... a functionally unitary trait or process should nevertheless not be considered established by a pattern in a single factor analytic research, but must reappear consistently and persistently in independently rotated studies."

The present status of research can be summarized as follows:

1. Personality factors have been discovered and solidly replicated in both the rating and questionnaire test media (7).

2. Factors in the rating and questionnaire realm have been securely linked to each other with all but a few factors now in one realm finding their counterparts in factors in the other realm (7).

3. The process of discovery and replication of factors is nearing completion in the objective test medium. This is true for general objective test factors (2, 4) as well as for ergic test factors (7, 9). The ergic or drive measurement is a new and specialized type of objective test, developed and factorized by Cattell and Baggaley (9).

The present study aims to fill the gaps in our present knowledge by (*a*) adding one more replication for confirmation of the existence of each objective test factor and (*b*) investigating the relationship between objective test factors (both general and ergic) and factors in the questionnaire realm. The latter may be first-order questionnaire factors, loaded by questionnaire items (6), or second-order questionnaire factors, based on correlations among first-order factors (5). As for problem (*b*) above, heretofore matches between questionnaire and objective test factors have been primarily based on consideration of the nature of a factor in one realm, and the search for a factor of similar nature in another realm. More precise evaluation of matching has been impossible

* According to Cattell, an objective test is (7, p. 897) "A test in which the subject's behavior is measured, for inferring personality, without his being aware in what ways his behavior is likely to affect the interpretation."

in most previously published works, since factors based solely on a single realm of measurement could have no variables in common with factors based solely on another realm. The present study is the first to overcome this difficulty by including in the same battery a broad coverage of marker variables for known questionnaire, general objective and ergic factors. Moreover, the linkage between questionnaire and rating realms is so well established that a match to a questionnaire factor is excellent presumptive evidence of a match to a parallel rating factor (7).

Design and Method

A total of 113 measurements were made on each of 86 male University of Illinois undergraduates.* There were 17 questionnaire measurements, including two factor estimates (each based on 10 to 15 highly loaded items) for each of eight established questionnaire factors (A, C, F, H, I, M, O) (6, 7). There were 90 objective tests including several markers for each of ten general objective test personality factors plus two markers for each of five ergic objective (or drive) factors: Sex, Fear, Self-Assertion, Self-Sentiment, and Appeal (4, 7, 9). In addition to this overall personality coverage through differing test media, there was concentration on established and putative measures of anxiety, including ratings of each subject's anxiety level by each of two independently working psychiatrists. Each psychiatrist evaluated overall level of anxiety and psychiatrist II also evaluated level of "free", "bound", "characterological", and "situationally determined" anxiety. Specialized discussions of this and related anxiety data will be found in Cattell and Scheier (10, 12).

Pearson-product-moment correlations were computed among all 113 variables and centroid factors were extracted. Test of completeness of factor extraction indicated 15 significant factors which were then rotated blindly (without knowledge of the variable identifications) to simple structure. After 25 rotations, an excellent simple structure was achieved, with 67 per cent. of the variables in the hyperplane and with correlations between reference vectors as shown in Table I.

TABLE I

Correlations Between the 15 Rotated Reference Vectors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 ..		−11	+12	+07	+14	−07	+14	−12	−02	+14	+02	+06	+18	+00	+14
2 ..			+18	+04	+06	+06	−20	−02	−05	+06	−14	−04	+01	+03	+09
3 ..				+15	+15	+00	+03	−28	+18	+09	−03	−18	+12	−11	+03
4 ..					+15	−04	−10	+09	+06	+04	−15	−19	+05	+06	−09
5 ..						−10	+18	−01	−02	−08	+00	+17	+09	−14	−04
6 ..							−15	+04	−08	+05	+17	−13	+01	−02	−14
7 ..								−06	−19	−16	+07	+06	+02	+00	+06
8 ..									−09	+07	−09	−04	−17	+07	+05
9 ..										+19	+06	−07	+07	−03	+03
10 ..											−16	−05	−06	+09	+21
11 ..												+09	−13	+12	+02
12 ..													+05	−05	+18
13 ..														+05	−20
14 ..															−20
15 ..															

---

* Every one of these measurements loads significantly on at least one of the fifteen factors reported. Detailed information on the tests and variables employed may be secured by writing to the Laboratory of Personality Assessment and Group Behavior, 106 South Goodwin Street, Urbana, Illinois, U.S.A.

Results: Description of Individual Factors

First we will discuss the loading pattern for each individual factor; then we will proceed in the following section to an overall discussion of the factors as they bear on the relations between the three media of observation. The association between a factor in this study and established questionnaire factors is given by the averaged loading of the two factor estimates of that questionnaire factor (from highly loaded items). Variables described as general objective and ergic objective factor markers have previously loaded highly and consistently on a given established objective test factor and thus are used to identify that factor (2, 4, 10, 11). When a test is matched with an objective test factor, loadings are given for all of the marker variables for that factor which are present in the present study, even though these loadings do not achieve statistical significance. In the interests of brevity, and since sample size was relatively small, statistical significance is set rather high, at 20, for all other loadings.

Table II

*Factor 1, U.I. 24(+), Anxiety**

1.	+61	Q4(+) More tension.
2.	+56	More symptoms on anxiety checklist.
3.	−48	C(−) More emotionality.
4.	+42	Higher level of free anxiety, Psychiatrist II.
5.	+41	More sex erg (more romantic).
6.	+40	More ataxic sway suggestibility.
7.	+37	More willingness to admit common frailties.
8.	−36	H(−) Threctia or "shyness".
9.	+36	Higher overall level of anxiety, Psychiatrist I.
10.	+33	O(+) More timid.
11.	+30	Higher ratio acquaintances to friends, more lonely.
12.	+30	Higher overall level of anxiety, Psychiatrist II.
13.	−29	Lower fear erg (less fear of atom bomb).
14.	+29	Slower tempo in leg circling.
15.	+27	Relatively more fluency on own (vs. others) characteristics.
16.	+27	More modesty on one's skill in untried performances, less confident.
17.	−27	Small total number of friends.
18.	+27	Higher level of situational anxiety, Psychiatrist II.
19.	+25	Faster rate of conditioning (PGR).
20.	−25	Lower self assertive erg (don't like to have political arguments).
21.	−24	Less increase of heart rate after startle.
22.	+24	Higher sex erg (desire to satisfy sexual needs).
23.	+24	More susceptible to embarrassment.
24.	+22	Slower irregularly warned reaction time.
25.	−20	Slower decision time on principles vs. particulars.
26.	−20	Lower fear erg (less fear of accident and disease).
27.	+17	More pronounced tendency to agree.
28.	+15	High susceptibility to annoyance.
29.	+14	M(+) Autia or non-conformity.
30.	+11	More critical severity vs. indulgent standards.
31.	−02	Questionable preferences in books.

* In this and all subsequent tables, the average loadings of the two estimates for each questionnaire factor is identified first by an alphabetic symbol, e.g. C, H, Q4, etc., while factors among general objective tests are designated by U.I. (universal index) followed by a number, e.g. U.I. 24, in both cases according to a standard system employed by this laboratory (3, 6). The direction of loadings is always given by their title in the table.

The second order questionnaire anxiety factor (5) is matched almost perfectly (≠ 1, 3, 8, 10 and 29)*. At the same time there is an excellent match to U.I. 24, the first order objective test anxiety factor (4, 10) in marker loadings 2, 5, 7, 13, 14, 16, 22, 27, and 30, with 31 the only reversal in expected sign. Ergic measurements also are widely involved in this factor (≠5, 13, 20, 22, 26) showing a fairly good match to a second-order factor among ergs (7, p. 566). The match is to the "Ergic Expression" (vs. "Ergic Suppression") pole of this factor, in high sex, low fear, and low self-assertion drives. This jibes well with the otherwise evident character of "free" and "undefended" anxiety in the factor (≠4, 7).

---

* Throughout, the symbol "≠" refers to the loading order number in the table under discussion.

Validity in terms of the common field of reference for the term "anxiety" is provided by the anxiety symptom checklist (≠2) and psychiatric evaluations of high anxiety level (≠4, 9, 12, and 18). However, psychiatric evaluations of bound and characteriological anxiety, also present in the matrix, do not appear on this factor. Other major characteristics of the factor are: (*a*) timidity and lack of self-assurance (≠7, 8, 10, 16, 20, 27 and perhaps 6), (*b*) irritability and susceptibility to embarrassment (≠23, 28), (*c*) higher sex erg (≠5, 22), (*d*) guilt (≠7 and perhaps 30), (*e*) loneliness (≠11, 17), (*f*) a slowness (≠14, 24) which is possibly related to timidity, and (*g*) fast rate of PGR conditioning (≠19), the last of which has previously been found to be associated with anxiety (1). A much more detailed discussion of U.I. 24 is found in Cattell and Scheier (10).

TABLE III

Factor 2, U.I. 23(+) *Neural Reserves versus Neuroticism*

1.	+58	Faster rate of reading aloud (normal conditions).
2.	+57	Faster correct word rate in reading (delayed feedback)*.
3.	+44	Faster rate of reading (delayed feedback).
4.	+44	Fast correct word rate in reading (normal conditions).
5.	+41	More persistence with old response in face of failure.
6.	−41	Less "mind-wandering", more ability to do numerical problems in head.
7.	+39	More figures added correctly.
8.	+38	Higher ratio of accuracy to accomplishment.
9.	−37	Lower appeal erg (less desire to heed parents).
10.	−37	Less motor-perceptual rigidity.
11.	+34	Greater volume of saliva secreted.
12.	−31	Low absolute level of galvanic skin resistance.
13.	−28	Less recovery of PGR when relaxed from shock.
14.	−26	Less work decrement due to anxiety sound distraction.
15.	+25	Less decrease in writing size as a function of foresight.
16.	+24	More speed in Gestalt Completion.
17.	+24	High total fluency in writing and speaking.
18.	+23	Less "verbal rigidity" (higher type-token ratio).
19.	+22	Faster rate of *ad lib* speaking (delayed feedback).
20.	+22	More correctly articulated words per unit time (delayed feedback, speaking).
21.	+21	More correctly articulated words per unit time (delayed feedback, reading).
22.	+21	Higher proportion of correct words to total words spoken (delayed feedback).
23.	−20	Small increase in sound pressure (amplitude of voice) from normal to delayed reading.
24.	−15	Less ataxic sway suggestibility.
25.	+07	C(+) more ego strength.
26.	+04	Faster decision on principles than on particulars.
27.	+04	Prefer colour over form in sorting.
28.	+03	High index of carefulness.

* All reading measures were reading aloud. In the delayed feedback "stress" procedure, the subject hears his own voice while speaking and also his vocal output from a fraction of a second earlier. Fairbanks has described and analysed this measurement (13).

The match to U.I. 23 (+), "Neural Reserves", is well confirmed in marker loadings 8, 10, 24, 26, 27, and 28. The questionnaire Neural Reserves factor, C(+) has a low loading but in the expected direction (≠25).

The major characteristics of the factor are speed of reading and speaking, (≠1, 2, 3, 4, 19, 20, 21), high fluency (≠17), carefulness (≠8), correctness of articulation (≠2, 4, 20, 21, 22), better performance in relatively simple speeded cognitive tasks (≠6, 7, 16), resistance to stress or distraction (≠2, 6, 14, 19, 20, 21, 23), low rigidity (≠10, 18), and self-reliance or wilfulness (≠5, 9, and O(−) "Confidence" loads ·19).

The above characteristics strongly and consistently indicate speed and competence at the Neural Reserves pole. A much more detailed discussion of U.I. 23 is available in Cattell and Scheier (11).

TABLE IV

Factor 3, U.I. 26(+), Self-Sentiment Control

1.	+56	Better immediate memory for words.
2.	−50	Less fidgeting (on fidgetometer).
3.	+44	Higher ratio acquaintances to friends—more lonely.
4.	−41	Fewer slanting line errors made on CMS.
5.	+41	More acquaintances recalled in fluency test.
6.	−37	Less reluctance to enter fear situations.
7.	+36	Higher ratio of accuracy to accomplishment.
8.	+34	Higher academic achievement.
9.	+33	Goal achievement further off in time, more long-circuitedness.
10.	−31	Fewer errors of response in complex reaction time.
11.	+31	More dilation of pupil at stress.
12.	−31	More ability to do problems in head, less mind-wandering.
13.	+31	Slower tempo of leg circling.
14.	+29	Faster ideomotor speed.
15.	+28	More cramped writing.
16.	+27	More correctly articulated words per unit time in normal reading.
17.	−26	Low acid pH saliva (more acidic).
18.	+24	More verbal rigidity (lower type-token ratio).
19.	−24	Lower self-assertive erg (less desire for smart appearance).
20.	+23	Higher self-sentiment erg (desire for control over mental processes).
21.	−22	Less slowing of reaction time due to shock.
22.	+21	Slower rate of reading (normal conditions).
23.	−21	Little increase in writing size when hastened.
24.	−20	Fewer friends recalled in fluency test, more lonely.
25.	+20	Better at simple addition problems.
26.	−11	Tendency to prefer form over colour in sorting.
27.	+05	Relatively more fluent about self as contrasted with others.
28.	+00	Classical motor-perceptual rigidity.

Marker loadings 1, 8, 10, 26, 27, and 28 indicate a fairly good match to objective test factor U.I. 26(+), "Self-sentiment Control". Self-control appears in desire for self control (high self-sentiment erg, ≠20), carefulness (≠4, 7, 10, 16, but contrast 6), undistractibility (≠12, 21, 23, but contrast 11), goals far off in time (≠9), cognitive achievement, especially better memory (≠1, 8, 25), and possibly, too, in physical steadiness (≠2, and low ataxic sway loads ·15). Not so clearly related to this main trend are loneliness (≠3, 24), low self-assertion (≠19, and perhaps 15), and slowness (≠13, 22, but contrast 5 and 14). Generally, there emerges the previously reported U.I. 26(+) picture of steady, serious, effective thinking (4).

TABLE V

1.	+59	Modesty in assuming skill in untried performance.
2.	−43	Tendency for form choices to predominate over colour in sorting.
3.	+41	Loud speaking voice (high sound pressure).
4.	+40	Loud speaking voice (high sound pressure) in delayed feedback.
5.	−37	Good ability to do problems in head, less "mind-wandering".
6.	+36	Loud voice in reading (delayed feedback).
7.	+35	High magnitude of hand tremor.
8.	+35	Relatively better memory for fearful (vs. neutral) material.
9.	−34	Less pupil dilation at stress.
10.	+32	High susceptibility to annoyance.
11.	+29	Higher fear erg (fear of accident-disease).
12.	−27	Low susceptibility to embarrassment.
13.	+26	F(+) Surgency (cheerful, alert).
14.	−25	Low deliberateness (i.e. quick decisions).
15.	−25	Low self-estimate of skill in a variety of tasks.
16.	−24	O(−) Confidence.
17.	−23	Less fidgeting (fidgetometer).
18.	−23	Lower ratio, regularly/irregularly warned reaction time.
19.	−23	Less deprivation of common life goals (self-estimated).
20.	−22	Lower appeal erg (don't wish to serve God).
21.	+21	Larger myokinetic movement.
22.	+21	Less decrease in writing size as a function of foresight.
23.	−21	Less acceleration to competition.
24.	+20	Relatively faster decision time on principles (vs. particulars).
25.	+10	Better at addition.
26.	+06	Good immediate memory.
27.	+05	More pronounced tendency to agree.
28.	−05	More shift to successfuls.
29.	+00	Mean PGR deflection to threat.

The match to U.I. 21(+) is only fair in marker loadings 1, 21, 25, 26, 27, 28, 29. All but one of the marker loadings are low and ≠28 is a reversal of expected marker sign. Generally, however, the factor has the decisive, exuberant characteristics to be expected in U.I. 21(+). There is lack of restraint in loud voice (≠3, 4, 6), cheerful, alert surgency (≠13), low susceptibility to embarrassment (≠12), quickness of decision (≠14), and lack of foresight (≠22). Self-reliance appears in low desire to serve God (≠20), and more speculatively, in self-satisfaction (≠16, 19, but contrast 15), insensitivity to competition (≠23), and less mind-wandering (≠5). Fearfulness and irritability (≠8, 10, 11) are somewhat puzzling with "exuberance" and loadings 7, 9, and 17 do not seem to fit well with one another or with the general interpretation of exuberant energy and self-reliant decisiveness.

TABLE VI

Factor 5, U.I. 32(+) Schizothyme Withdrawal and F II (−) Introversion

1.	−53	A(−) Schizothymia (withdrawn).
2.	−44	Relatively less fluent on self (vs. others) criticism.
3.	−42	Relatively faster on regularly warned reaction time.
4.	+36	Faster correct word rate in reading (delayed feedback).
5.	+31	Higher handwriting pressure.
6.	+30	More shift to successfuls (ego weakness).
7.	−29	Fewer slanting line errors made on CMS.
8.	+28	More pupil dilation at stress.
9.	−28	Low level of free anxiety, Psychiatrist II.
10.	−26	Relatively less fluent about own characteristics.
11.	+26	Larger myokinetic movement.
12.	−25	Lower systolic blood pressure.
13.	−24	Less increase of heart rate after startle.

14.	+24	Preference for weaker smells.
15.	−24	Prefer strange over familiar material.
16.	+22	Higher ratio acquaintances to friends (more lonely).
17.	+22	More correctly articulated words (delayed feedback reading).
18.	+22	Faster rate of reading (delayed feedback).
19.	+22	Higher ratio accuracy to accomplishment.
20.	+21	Better immediate memory for words.
21.	−20	Lower level of self-estimated experience in various skills.
22.	−16	H(−) Threctia (shyness).
23.	−11	F(−) Desurgent (depressed, slow).
24.	+10	Less confident assumption of skill.
25.	−01	M(−) Not autious.

There is a good match to U.I. 32(+), Schizothyme Withdrawal, in markers 6, 10, and 24. There is some uncertainty as to what the sign of marker ≠7 should be for this factor, but "few errors", as here, seems to be the more reasonable direction. This factor also matches the Introversion pole of second order questionnaire factor II (5) in loadings 1, 22, 23, but 25 reverses. As one might expect in schizothyme withdrawal there is loneliness (≠16), lack of self-confidence (≠21, 24), and greater accuracy (≠4, 7, 17, 19). Lower level of free anxiety appears in ≠9 and is confirmed in a loading of −16 on an anxiety symptom checklist. This may mean that schizothyme withdrawal is an at least partly successful defence against free-floating anxiety. Finally, withdrawal is suggested by ≠14 and possibly ≠15, while ≠12 and 13 (but contrast ≠8) suggest a physiological sluggishness not inconsistent with withdrawal. Some loadings seem indifferent to a withdrawal interpretation while others, particularly the high speed measures (≠4, 17, 18) are quite difficult to fit in. Generally, however, a withdrawal picture emerges.

Table VII

Factor 6, U.I. 22(+), Corticalertia

1.	+68	Faster ideomotor speed.
2.	+43	More total fluency in perceiving hidden objects in drawings.
3.	+42	Better at simple addition.
4.	+39	Many acquaintances (more fluency in remembering acquaintances).
5.	+35	More threatening objects perceived in modernistic drawings.
6.	−33	Less critical severity.
7.	−31	Faster irregularly warned reaction time.
8.	+30	Higher sex erg (desire to satisfy sex needs).
9.	−30	Less self sentiment erg (less desire for self-respect).
10.	+30	More careless in a pencil maze.
11.	+27	More slowing of reaction time by shock.
12.	−24	Less honesty in admitting common frailties.
13.	+24	Preference for weaker smells.
14.	−24	More ability to do problems in head, less mind-wandering.
15.	+23	Higher ratio acquaintances to friends, more lonely.
16.	−22	Less myokinetic movement.
17.	+20	Higher acid pH saliva (more alkaline).
18.	+20	H(+) Parmia or "venturesomeness".
19.	+09	More fidgeting (fidgetometer).
20.	+04	Relatively slower on regularly vs. irregularly warned RT.

Loadings 1, 2, 7, 19, and 20 confirm a good match to objective test factor U.I. 22(+), "Corticalertia" or "Nervous Alert Reactivity". A main characteristic of this factor is speed and fluency, as shown in ideomotor speed (≠1), fast reaction time (≠7), rapidity in simple numerical operations (≠3, 14), and greater cognitive fluency (≠2, 4, 5). A tendency to uncritical "half-cocked" behaviour appears in less critical severity (≠6), less desire for self-respect (≠9), carelessness in a pencil maze task (≠10), and possibly in greater slowing of reaction time by shock (≠11). Finally, boldness emerges in venturesomeness (≠18 but contrast 13) and high sex erg (≠8). The "loneliness" loading (≠15) was probably due to inflation of the numerator of the ratio by fluency in remembering acquaintances (≠4). This factor is characterized by speed in simple mental processes, and bold, uncritical reactions.

TABLE VIII

Factor 7, U.I. 25(+), Accurate Realism vs. Psychotic Tendency

1.	−53	Low fluency in perceiving hidden objects in drawings.
2.	−49	Low speed in Gestalt Completion.
3.	+47	O+ Timidity.
4.	−42	Fewer slanting line errors on CMS task.
5.	−33	Lower sex erg (less desire for romantic love).
6.	−31	Fewer threatening objects perceived.
7.	+28	More careful in observation.
8.	+26	Q4 + More nervous tension.
9.	+25	More verbal diversification in speaking and writing (higher type-token ratio).
10.	+25	Higher appeal erg (want to serve God).
11.	+23	More anxiety, evaluated via answers on a biographical inventory.
12.	−22	Less increase of heart rate after startle.
13.	+22	Higher ratio acquaintances to friends, more lonely.
14.	−21	Underestimate length of frightening time periods.
15.	+20	More symptoms on anxiety checklist.
16.	+19	Better at simple addition.

The only two U.I. 25 marker variables in the study (≠2, 16), loaded as required for a match to U.I. 25(+), accurate realism. The factor shows low perceptual fluency (≠1, 6), carefulness (≠4, 7), less increase of heart rate to startle (≠12), anxiety and timid cautiousness (≠3, 8, 11, 15 but contrast 14), desire to serve God (≠10), more verbal diversification (≠9), loneliness (≠13), less desire for romantic love (≠5), and effectiveness in simple numerical operations (≠16). The last two characteristics especially suggest the realism one would expect at the positive pole. The anxiety at the positive pole suggests that psychoticism may function as an escape from anxiety.

TABLE IX

Factor 8, M (+), Autia

1.	−50	Low increase in sound pressure from normal to delayed feedback reading.
2.	+42	High amplitude (sound pressure) of voice in normal reading.
3.	+40	M (+) Autia or "non-conformity".
4.	+37	More anxious, Psychiatrist I.
5.	−31	Lower academic achievement.
6.	−30	Questionable book preferences.
7.	+29	Relatively faster decision time on principles (vs. particulars).
8.	+29	Louder voice (higher sound pressure) in normal speech.
9.	−27	Less acceleration to competitive situations.
10.	+26	More slowing of reaction time due to shock.
11.	−26	Small rise in speaking sound pressure from normal to delayed feedback conditions.
12.	−24	Less honesty in admitting common frailties.
13.	−24	Faster irregularly warned reaction time.
14.	−24	Lower type-token ratio, more verbal rigidity.
15.	−24	Less pupil dilation at stress.
16.	−23	Low susceptibility to embarrassment.

17.	+23	Fewer hidden objects perceived in unstructured drawings.
18.	−22	Low susceptibility to annoyance.
19.	−22	Less careful in observation.
20.	+22	More rigidity (classical motor-perceptual).
21.	−22	Underestimate length of fear periods.
22.	−20	Lower ratio of accuracy to accomplishment.

The best match is to questionnaire factor M+, autia or "non-conformity". Questionnaire factor M+ is a high-loading variable (≠3) and the only questionnaire factor measure which loads. Moreover, the objective test loadings fit well the autia picture we have from questionnaire data (6, 7). There is placidity (≠9, 16, 18, and speculatively 1, 11, 12, 15, 21), undependability (≠19, 22, and possibly 5, 10), and unconventionality (≠6, and possibly 16). Greater rigidity (≠14, 20) is difficult to understand with the unconventionality of M+, but loud voice (≠2, 8) and large uncramped writing (loads ·18) suggest a quite reasonable expansive expressiveness. Psychiatrist I's evaluation of higher overall anxiety level (≠4), seems inconsistent, unless the M+ placidity is really just a façade, as Cattell has suggested (6). However, as we have noted in another report (12), the absence of Psychiatrist II's evaluation here, suggests that the loading may only indicate Psychiatrist I's particular tendency to equate anxiety with non-conformity.

TABLE X

Factor 9, Low Appeal Erg: Independence and Loneliness with Some Anxiety

1.	−42	Lower appeal erg (less desire to be in touch with God).
2.	+41	More susceptibility to annoyance.
3.	−38	Lower appeal erg (less desire to heed parents).
4.	+37	More long-circuitedness—goals further off in time.
5.	+35	More fluent about own (vs. others) characteristics.
6.	−34	Fewer friends.
7.	+31	More sex erg (want to satisfy sex needs).
8.	+29	More work decrement due to distraction by aesthetic material.
9.	−29	Lower mean hand writing pressure.
10.	+28	Less decrease in writing size as a function of foresight.
11.	−28	Less persistence with old response in face of failure.
12.	+28	More "situational" anxiety, Psychiatrist II.
13.	−27	Lower systolic blood pressure.
14.	−26	Prefer strange over familiar material.
15.	+26	Relatively faster decision time on principles (vs. particulars).
16.	−25	Less critically severe.
17.	−25	Poorer at simple addition.
18.	+25	Larger myokinetic movement.
19.	+25	Relatively slower on regularly vs. irregularly warned reaction time.
20.	−23	Relatively poorer memory for fearful material.
21.	+23	More "free" anxiety, Psychiatrist II.
22.	−22	More readiness to enter fear situations.
23.	+21	Larger mean PGR deflection to threat.
24.	+21	Less verbal rigidity (higher type-token ratio).

This factor does not match any previously reported replicated general objective test factors. It involves independence, self-reliance and self-concern (≠1, 3, 5, and possibly 14), clinically evaluated anxiety (≠12, 21), several U.I. 24 anxiety markers (≠2, 7, 9, 19) irritability and distractibility (≠2, 8), loneliness (≠6), and long-circuitedness (≠4) (which may here indicate pessimism).

The factor is not identical to U.I. 24 anxiety (F1 here) since many U.I. 24 markers fail to load; marker ≠16 is in the reverse-to-expected direction, and the salient variable index (8) shows that there is no more than chance association between loading patterns on the two factors.

The factor is identified as low appeal erg since both appeal erg markers (≠1, 3) are peak-loading variables, and independence is consistently suggested elsewhere in the factor. The associated tendencies to anxiety, irritability, pessimism, and loneliness suggest a "bloody but unbowed" or "Invictus" title.

TABLE XI

Factor 10, U.I. 18(+), Hypomanic Smartness

1.	+50	Higher appeal erg (more desire to serve God).
2.	−43	Lower overall anxiety level, Psychiatrist II.
3.	+35	H (+) Parmia ("venturesomeness").
4.	+32	More circles used in CMS.
5.	−32	Relatively faster on regularly vs. irregularly warned reaction time.
6.	+32	Large increase in sound pressure from normal to delayed feedback reading.
7.	−28	Lower level of "bound" anxiety, Psychiatrist II.
8.	+28	Large increase in sound pressure from normal to delayed speaking.
9.	+27	More errors in complex reaction time.
10.	+27	Premsia or "tender-mindedness".
11.	+26	Fast rate of PGR conditioning (light-shock).
12.	+25	Higher mean hand-writing pressure.
13.	+25	Larger pupil diameter at stress.
14.	+24	F+ Surgency (alert, cheerful).
15.	+23	More work decrement due to sound distraction.
16.	−22	Goal achievement closer in time.
17.	+21	More fidgeting on fidgetometer.
18.	−20	Relatively lower proportion of consonant recall.
19.	+09	More slanting lines made on CMS.
20.	+08	Tendency for colour choices to predominate over form in sorting.
21.	−03	Less shift of opinion to successfuls.
22.	−08	Low ratio of self-criticism to criticism of others.

There is a rather poor match to objective test factor U.I. 18(+), (≠4, 18, 19, 20, but 21 and 22 are in the reverse-to-expected direction). Confirming the "rapid headlong action" aspect of U.I. 18(+) we have active response to stress (≠6, 8, 11, 13, 15), venturesomeness and optimism (≠3, 14 and possibly 16), restlessness (≠17), and carelessness (≠9). Several loadings are difficult to fit in with the above picture, notably, high appeal erg (≠1), and tender-mindedness (≠10). Moreover, insecurity was expected at the U.I. 18(+) pole but we find low anxiety instead (≠2, 7).

TABLE XII

Factor 11, U.I. 17(+), Inhibition, Restraint

1.	+54	More threatening objects perceived in unstructured drawing.
2.	+36	More total fluency of perception in unstructured drawings.
3.	−33	Prefer strange over familiar.
4.	+33	More work decrement due to distraction by aesthetic material.
5.	−33	Lower appeal erg (don't want to heed parents).
6.	−30	Slow correct word rate (delayed feedback).
7.	−30	More confident of skill in untried performances.
8.	−29	Few correctly articulated words (normal reading).
9.	−28	Less shift to successfuls.
10.	+27	Higher level of self-estimated skill.
11.	+26	Low ability to do problems in head.
12.	+26	Higher acid pH saliva (more alkaline).
13.	−25	Low susceptibility to annoyance.

14.	+25	Large increase in sound pressure from normal to delayed feedback conditions.
15.	−25	Low ratio accuracy to accomplishment.
16.	+25	Less verbal rigidity (higher type-token ratio).
17.	−25	Less susceptible to embarrassment.
18.	+24	High fluency in speaking and writing.
19.	−24	Low level of free anxiety, Psychiatrist II.
20.	−24	Less increase in heart rate after startle.
21.	−23	Low self assertive erg (don't want to be smartly dressed).
22.	−22	Less long-circuited (life goals closer of attainment).
23.	−22	Slow rate of PGR conditioning.
24.	+18	More restrained book preferences.
25.	+12	High ratio of regularly/irregularly warned reaction time.
26.	−12	Less speed in gestalt completion.
27.	+09	More carefulness in observation.
28.	+09	Larger mean PGR deflection to threat.

This factor is very difficult to interpret. A possible match to factor U.I. 17(+), Inhibition, is suggested in loadings 1, 15, 24, 25, 26, 27, and 28, but 15 is a bad reversal in expected sign and most of the marker loadings are very low. Moreover, when we take leave of marker variables, only a few loadings seem consistent with an inhibition interpretation; e.g., low self-assertive erg (≠21), and slow rate of conditioning (≠23). Most of the variables are either indifferent to an inhibition interpretation or actually contradict it. Among the latter are self-confidence (≠7, 10), self reliance (≠5, 9), general verbal and perceptual fluency (≠2, 18) and preference for the strange (≠3).

TABLE XIII

Factor 12, U.I. 16(+), Competent Assertiveness

1.	−45	Tend to overestimate length of fear periods.
2.	+39	Relatively more fluent on own (vs. others) characteristics.
3.	+39	Higher systolic blood pressure.
4.	−35	Low self sentiment drive (not worried about self-respect).
5.	+35	Faster correct word rate in normal reading.
6.	+34	Faster total rate in normal reading.
7.	+33	Relatively more fluent about self (vs. others) criticism.
8.	−29	Less ataxic sway suggestibility.
9.	+28	Relatively better memory for fearful (vs. neutral) material.
10.	−26	Less careful in observation.
11.	−26	Less honest in admitting common frailties.
12.	+25	Higher fear erg (fear of accident-disease).
13.	−25	Lower self-assertive erg (don't care about good personal appearance).
14.	−24	I(−), Harria, or "tough-mindedness".
15.	+23	More pronounced tendency to agree.
16.	+22	More circles used on CMS.
17.	+20	More errors made in complex reaction time.
18.	+15	More restrained preferences in books.
19.	+15	More fluent in perceiving objects in unstructured drawings.
20.	+01	More rigid (classical motor-perceptual).

There is a fair match to U.I. 16(+), Competent Assertiveness, in markers 16, 18, and 19, but 20 reverses and there are only a few other variables consistent with the "fast, determined, effective action and insuggestibility" character of U.I. 16(+). Among these are high speed and fluency (≠5, 6, 19), tough-mindedness (≠14), low ataxic sway suggestibility (≠8), and possibly high systolic pulse pressure (≠3). Seemingly inconsistent with determined competence are carelessness (≠10, 17, and possibly 11, 16), high tendency to agree (≠15), fearfulness (≠12 and possibly 9), low self-regard erg (≠4, 7 but contrast 11) and lower self-assertiveness (≠13). Perhaps the apparent competence of U.I. 16(+) is a somewhat panicked cover-up for deeper insecurity.

Table XIV

Factor 13, U.I. 20(+), Comention or Sociable Willingness

1.	+52	More pronounced upward trend of galvanic skin resistance when relaxed from shock.
2.	+45	Relatively higher proportion of consonant (statements agreed with) recall.
3.	+40	Better immediate memory for words.
4.	−35	Less involuntary muscle tension in right arm.
5.	−35	Lower amount of PGR conditioning.
6.	+35	More saliva volume.
7.	−33	Lower overall level of anxiety, Psychiatrist II.
8.	−33	Low level of characterological anxiety, Psychiatrist II.
9.	−33	Low level of free anxiety, Psychiatrist II.
10.	+31	Many friends.
11.	+31	Larger myokinetic movement.
12.	−31	Lower total fluency of perception in unstructured drawings.
13.	−25	Low level of situational anxiety, Psychiatrist II.
14.	+24	High susceptibility to annoyance.
15.	−23	Low level of bound anxiety, Psychiatrist II.
16.	+20	More pronounced tendency to agree.
17.	+09	More restrained book preferences.
18.	+08	More willing to admit common frailties.
19.	+04	More slanting line errors made in CMS.
20.	−01	Less shift to successfuls.

There is a fairly good match to objective test factor U.I. 20(+), Comention, in loadings 1, 2, 14, 16, 17, 18, and 19, but marker ≠20 reverses slightly. The major characteristics are an orientation toward acquiescence (≠2, 16), having many friends (≠10), and low level of clinically evaluated anxiety according to Psychiatrist II (≠7, 8, 9, 13, 15). Psychiatrist II probably interpreted the co-operativeness of U.I. 20(+) as lack of resistance to probing questioning ("having little to hide"), hence as low anxiety (12). A lower *amount* of PGR conditioning (≠5) goes with low clinically-evaluated anxiety, perhaps accounting for the positive relationship between anxiety and PGR conditioning which some writers have claimed (1). However, this relationship appears only for Psychiatrist II's evaluation of anxiety and fails to appear in U.I. 24, (F1), the major anxiety factor thus far found (10). The low involuntary muscle tension (≠4) may prove significant in understanding the influences governing amount of PGR conditioning.

Most other loadings above are consistent with a U.I. 20(+) sociable willingness interpretation, but irritability (≠14) is somewhat puzzling and several other loadings (≠3, 6, 11, 12) seem indifferently related to this general interpretation.

Table XV

Factor 14, U.I. 19(+), Critical Exactness, Firm Control with Some Independence

1.	−51	Low fear erg (atomic bomb).
2.	+42	More acceleration of work to competition.
3.	+36	Higher self sentiment erg (want self-control).
4.	−32	Faster irregularly warned reaction time.
5.	−30	Relatively less fluent in self (vs. others) criticisms.
6.	+30	Higher level of involuntary muscle tension in right arm.
7.	−30	Lower academic achievement.
8.	+29	More done correctly in Gestalt completion.
9.	+29	Higher level of self-estimated ability.

10.	−29	Larger, uncramped, handwriting.
11.	+27	More increase of writing size when hastened.
12.	+26	More work decrement due to "anxiety" sound distractions.
13.	+24	H(+), Parmia or "venturesomeness".
14.	+23	F(+), Surgency or alert cheerfulness.
15.	+23	More critically severe.
16.	+23	Higher self-assertive erg (want good personal appearance).
17.	+23	Higher level of self-estimated experience in various performances.
18.	+22	Higher sex erg (want to satisfy sex needs).
19.	−22	Less anxious, Psychiatrist I.
20.	−18	Fewer errors made in complex reaction time.
21.	−16	Fewer circles used in CMS.
22.	−10	Less upward trend of skin resistance when relaxed from shock.
23.	+04	More careful in observation.
24.	−04	Less rigidity (classical motor-perceptual).
25.	−03	Fewer slanting line errors made on CMS.
26.	+02	Predominance of colour over form choices in sorting.

All U.I. 19(+) markers present in this battery load in the correct direction (≠5, 15, 20, 21, 22, 23, 24, 25, 26). The firm control character of U.I. 19(+) also appears in high self-sentiment drive (≠3), low fear erg (≠1), low level of clinically evaluated anxiety (≠19), more self-confidence (≠9, 17), with however some tendency to become "rattled" (≠11, 12). Critical exactness appears in loadings 8, 15, 20, 21, and, speculatively, in the "alertness" of surgency, ≠14, but venturesomeness, ≠13, seems inconsistent. The high self-assertion and sex ergs (≠16, 18) suggest an assertiveness akin to independence. The speed, tension, and expansiveness tentatively suggested by loadings 2, 4, 6, and 10 do not jibe well with other characteristics of the factor, and *low* academic achievement (≠7), is particularly puzzling. But generally, firm control and critical exactness appear as required for a U.I. 19(+) interpretation.

TABLE XVI

Factor 15, Lower Self-Sentiment Strength-Weakness, Passivity

1.	−41	Lower self-sentiment drive (less desire for good control over mental processes).
2.	+35	Relatively faster decision time on principles (vs. particulars).
3.	−34	Less slowing of reaction time due to shock.
4.	−30	Smaller mean PGR deflection to threat.
5.	+29	Prefer weaker smells.
6.	28	Lower self-sentiment drive (less reluctance to damage self-respect).
7.	−28	Less decrease in writing size as a function of foresight.
8.	+26	Higher self-assertive erg (like to participate in political arguments).
9.	+24	More fidgeting (fidgetometer).
10.	+24	Higher fear erg (fear atomic bomb).
11.	+24	Higher level of self-estimated skill in various performances.
12.	+23	More circles used on CMS.
13.	−23	Less rigid (classical motor-perceptual).
14.	+21	More pronounced tendency to agree.
15.	−21	Less involuntary muscle tension in right arm.
16.	+20	Higher level of "free" anxiety, Psychiatrist II.

The factor matches no known objective test factor, but both low self-sentiment strength markers load highly on it (≠1, 6), and other loadings are consistent with a low self-regard picture. Weakness with a tendency to shift appears in preference for weaker smells (≠5), tendency to agree (≠14), low self-control in over-use of CMS circles (≠12), low rigidity (≠13), and possibly difficulty in grappling with details as facilely as with general principles (≠2).

Loadings 3, 4, and 7 *could* mean that S is too passive even to be upset by what alerts other people. Some fear and anxiety (≠ 10, 16) also appear. Only loadings 8 and 9 fail to fit in any obvious way the general picture of weakness, passivity and lack of self-respect.

Results: The Relations Between Factors in Questionnaire, General Objective, and Ergic Objective Realms

We now move from consideration of each individual factor to overall consideration of the factors found and the types of linkages they exemplify between questionnaire, general objective, and ergic objective factors.

(a) *Replication of Previously Discovered Objective-Test Factors*

All twelve of the major known objective test factors were confirmed in the present study. Except for U.I. 17 and U.I. 18, where confirmation was poor, the pattern of marker variable loadings and the general interpretation of all loadings sufficed to add one more confirmation to previous evidence for the existence of each of these factors (2, 4, 10, 11).

(b) *Relation Between Questionnaire Factors and Factors Among Objective Tests*

The test battery was composed predominantly of objective tests, with a consequent predominance of objective test variables loading on each factor. Therefore, all fifteen factors will be considered as "factors among objective tests", even those three which did not match established general objective test factors. Table XVII summarizes the relationships found between factors among

Table XVII

Summary of Types of Relationship Between Questionnaire Factors and Factors Among Objective Tests

Types of Relation Between Questionnaire and Objective Test Factors	Factors Among Objective Tests: No. of Factors	Factors Among Objective Tests: Identification of Factors	
(*a*) Had no questionnaire factor loadings	6	F2	(U.I. 23+)
		F3	(U.I. 26+)
		F11	(U.I. 17+)
		F13	(U.I. 20+)
		F9	low appeal drive
		F15	low self-sentiment drive
(*b*) Only one questionnaire factor estimate with low loading on the factor ..	2	F6	(U.I. 22+)
		F12	(U.I. 16+)
(*c*) Factor associated with a single high-loading, first-order questionnaire factor	1	F8	(M+)
(*d*) Factor loaded by pattern of two or three questionnaire factors, which, however, are not second-order questionnaire factor patterns ..	4	F4	(U.I. 21+)
		F7	(U.I. 25+)
		F10	(U.I. 18+)
		F14	(U.I. 19+)
(*e*) Factor identifiable with a second-order factor among questionnaire measurements	2	F1	(U.I. 24+ and FI (Q))
		F5	(U.I. 32+ and FII (Q))

objective tests and questionnaire factors, with the latter represented by two factor estimates each. This relationship is complex, with factors among objective tests ranging from absence of questionnaire factor associations to identifiability with second-order questionnaire factors. The tendency for simple one-to-one relationships which applies between rating and questionnaire domains obviously does not apply here. Some objective test factors have no questionnaire loading or only one low questionnaire loading (rows (*a*) and (*b*) of Table XVII), suggesting that the objective test medium has enabled personality measurement to capture aspects of behaviour which have escaped rating or questionnaire measurement*. It should come as no surprise that one test medium measures personality characteristics which others cannot, for Cattell has already shown that a few questionnaire factors have no single rating factor counterpart (7).

Even where there are definite linkages between questionnaire and objective test realms, the relationship is at differing levels of generality. One of the factors among objective tests is associated with a first order questionnaire factor (row *c*), while two others link up with second-order questionnaire factors. The latter two objective test factors are presumably broader in coverage than is the former. If all sixteen questionnaire factors, instead of only eight, had been included in the battery, some of the questionnaire patterns in row *d* of Table XVII might have emerged as second-order questionnaire factors, but there are only four second-order questionnaire factors in all (5), two of which have already been matched here. Therefore, questionnaire loading patterns other than second-order factor patterns will continue to appear on factors among objective tests and the levels of relationship in rows (*a*) to (*e*) of Table XVII will remain. Generally, objective test factors either (*a*) measure characteristics not well-captured by questionnaire measurements (rows *a* and *b*) or (*b*) measure broader areas of personality than do questionnaire factors, since it takes a pattern or group of questionnaire factors to measure what *one* objective test factor measures (rows *d* and *e*).

(c) *Relations Between Ergic Factor Markers and Factors in this Battery*

A factor in this study is considered matched to a drive or ergic factor only if it is highly loaded in the correct direction by both markers for that drive. Markers were included for only five of the ten or more established drive factors (7). In spite of this, Table XVIII shows that ergic markers loaded on twelve of the fifteen objective test factors present in this battery. This indicates breadth of coverage, but in a puzzling way, for in nine of the twelve factors loaded by ergic markers (rows *b* and *c*), one marker for a drive factor appears without the other marker. Further research may resolve these difficulties by employing broader and more intensive coverage of the ergic realm, with tests of higher reliability than was possible in exploratory research. On the positive side, two of our objective test factors could be identified with first-order drive factors (row *d*) while one paralleled a known second-order factor among drives (row *e*). The two factors identified as first-order drives were not matchable with any previously known general objective test factors; hence, it is clear that some ergic factors measure aspects of personality not presently covered by other types of measurement. At any rate we know that ergic factors have a complex relationship with general objective test and questionnaire factors. At least

---

* This proposition cannot be verified completely in the present study, since markers were missing for eight questionnaire factors needed to complete our coverage of this realm. However, it is highly unlikely that each of these eight would have been identifiable with a different one of the present objective test factors which have no questionnaire associations.

TABLE XVIII

Summary of Relations Between Dynamic Factors and the Factors Found in this Study

Type of Relationship	No. of Factors	Identification of Factors	
(*a*) No drive factor markers load on this factor	3	F5 F8 F13	(U.I 32+, FII (q)) (M+) (U.I. 20+)
(*b*) One or two ergic tests load, but never both markers for a given ergic factor	7	F2 F3 F4 F6 F7 F10 F11	(U.I. 23+) (U.I. 26+) (U.I. 21+) (U.I. 22+) (U.I. 25+) (U.I. 18+) (U.I. 17+)
(*c*) Three or four ergic tests load, but never both markers for a given ergic marker	2	F12 F14	(U.I. 16+) (U.I. 19+)
(*d*) Factor identifiable with an ergic factor, both markers load highly and dominate the factor	2	F9 F15	(low appeal erg) (low self-sentiment drive)
(*e*) A second-order drive factor pattern loads the factor	1	F1 F1	(U.I. 24+, FI (Q), and (Ergic))

three types of relationship are possible: (*a*) Ergic factor variance does not appear on known general objective test and questionnaire factors (row *a*); (*b*) First-order drive factors appear without general objective or questionnaire factor markers in their pattern (row *d*); and (*c*) A second-order drive factor pattern appears on at least one first-order objective and second-order questionnaire factor pattern (row *e*).

SUMMARY AND CONCLUSIONS

From a battery of 113 objective test, questionnaire, and rating variables, 15 factors were extracted and rotated to simple structure. Interpretations of each individual factor were made and an overview of factor identifications yielded the following general conclusions:

(a) *Confirmation of Previously Discovered Factors*

Twelve of the major established general objective test factors were again replicated in the present study. Two of these factors also matched second-order questionnaire factors. Of the three factors not matching replicated general objective test factors, one was identifiable with a first-order questionnaire factor, and two were identifiable as first-order dynamic source traits.

(b) *Relationship Between General Objective Test and Questionnaire Medium Factors*

This relation is complex. A factor among objective tests can be loaded by a first-order questionnaire factor, a second-order questionnaire factor, or a pattern of questionnaire factor loadings which is not a second-order factor. Secondly, eight objective test factors measure aspects of personality not covered by (i.e., not loaded by) the questionnaire factor markers in this battery. This plus the fact that other general objective test factors tend to be loaded by *groups* of questionnaire factors, suggests that general objective test measurement is broader than questionnaire measurement.

(c) *Relation of Drive Factors to General Objective and Questionnaire Factors*

Again the relation is complex. Two factors among objective tests were identified as first-order drive factors while one was identified as a second-order drive factor. Drive variance is not associated with some of the general objective test and questionnaire factors, while general objective and questionnaire factor markers are missing from two first-order drive factors. In nine out of fifteen factors, some of the ergic markers split, with one loading the factor and one absent.

BIBLIOGRAPHY

1. BITTERMAN, M. E., and HOLTZMAN, W. H., "Conditioning and extinction of the galvanic skin response as a function of anxiety", *J. Abnorm. Soc. Psychol.*, 1952, **47,** 615–623.
2. CATTELL, R. B., *The Principal Invariant Personality Factors Established in Objective Tests*, 1953. Urbana, Ill: Lab. of Pers. Assess. & Group Behav., Univ. of Illinois. (Adv. Publ. No. 1.)
3. *Idem*, *A Universal Index for Psychological Factors*, 1953. Urbana, Ill.: Lab. of Person. Assess. & Group Behav., Univ. of Illinois. (Adv. Publ. No. 3.)
4. *Idem*, "The principal replicated factors discovered in objective personality tests", *J. Abnorm. Soc. Psychol.*, 1955, **3,** 291–314.
5. *Idem*, "Second-order personality factors in the questionnaire realm", *J. Consult. Psychol.* 1956, **6,** 411–418.
6. *Idem*, *Handbook for the Sixteen Personality Factor Questionnaire*, 1957. Institute for Personality and Ability Testing, 1602 Coronado Drive, Champaign, Ill.
7. *Idem*, *Personality and Motivation Structure and Measurement*, 1957. New York: World Book Co.
8. *Idem* and BAGGALEY, A. R., *The Salient Variable Similarity Index-s-for Factor Matching*, 1954. Urbana, Ill.: Lab. of Person. Assess. & Group Behav., Univ. of Illinois. (Adv. Publ. No. 4.)
9. *Iidem*, "A confirmation of ergic and engram structure in attitudes objectively measured", *The Australian J. of Psychol.* (In press.)
10. *Idem* and SCHEIER, I. H., "The nature of anxiety: A review of thirteen multivariate studies, comprising 814 variables. *Psychological Reports.* (In press.)
11. *Iidem*, "The objective test measurement of neuroticism, U.I.23(−): A review of eight factor analytic studies". *Ind. J. Psychol.* (In press.)
12. *Iidem*, "Clinical validities by analyzing the psychiatrist: Exemplified in relation to anxiety diagnosis". *Am. J. Orthopsychiat.* (In press.)
13. FAIRBANKS, G., "Selective vocal effects of delayed auditory feedback", *J. Speech Hearing Disorders*, 1955, **20,** 333–346.

RECENT ADVANCES IN THE TREATMENT OF SCHIZOPHRENIA: GROUP TRAINING AND THE TRANQUILLIZERS

By

DONALD BLAIR, M.A., M.D., Ch.B., D.P.M.
Consultant Psychiatrist
St. Bernard's Hospital, Southall, Ashford Hospital, Middlesex and
St. Mary's Hospital, W.2

and

DESMOND M. BRADY, M.B., Ch.B., D.P.M.
Registrar
St. Bernard's Hospital, Southall

INTRODUCTION

It was Bleuler (1917) who introduced the conception of "schizophrenia" as a mental illness and described its characteristics. Since 1957 was the centenary of Bleuler's birth the attention of psychiatrists has been focused on the various problems and difficulties still confronting us today regarding the diagnostic, aetiological and therapeutic aspects of this disease.

In the last few years further advances have been made in the treatment of schizophrenia thanks to:

Group training and the institution of a more liberal and permissive regime.

The use of the new drugs chlorpromazine and reserpine (so-called "tranquillizers").

This paper is based on our experience of these new methods over a period of seven years—four years with group training methods alone, and three years with the additional use of tranquillizers. It describes our investigation and application of these methods and presents the outcome with due attention to diagnostic and prognostic factors, and to definitions of the varying degrees of improvement and to control figures. Thereafter our results are discussed in relationship to those of other writers with the object of assessing the situation as it stands today.

Our work was divided into four phases, each of which is allotted a section of this paper.

I. We treated chronic schizophrenic patients by group training methods over a period of four years.

II. We endeavoured by treating approximately prognostically equivalent groups of chronic patients with chlorpromazine and reserpine to obtain some degree of comparison between the therapeutic benefits derived from each.

III. This comparison having favoured chlorpromazine we treated with chlorpromazine a series of chronic patients (many of them having previously been treated by deep insulin and leucotomy).

IV. We applied the therapeutic scheme for chlorpromazine which we had devised from our experience with the chronic patients to all recent admissions (under five years' duration) with the aim of comparing our results with those obtained from deep insulin therapy and leucotomy.

Before proceeding further a few remarks regarding our attitude to the diagnosis and prognosis of schizophrenia are appropriate. Our diagnosis was fundamentally based on Bleuler's criteria, but as the result of over 20 years' experience we believe there is a necessity to differentiate carefully between typical and atypical schizophrenia—or what is termed on the European Continent "process schizophrenia" and "schizophreniform reactions" (Langfeldt, 1937). The prognosis of the atypical (schizophreniform) group is much better than that of the typical (process) group. Broadly speaking the most outstanding features of these two sub-divisions are:

Typical (*or Process*) *Schizophrenia* is characterized by the presence of some or all of the following symptoms against the usual diagnostic picture of schizophrenia (as described by Bleuler):

Intense feelings of bodily change—depersonalization, derealization and gross sensations of influence (Langfeldt's Process Symptoms); pronounced stereotypies, mannerisms, grimacings, negativisms and automatisms; extreme autochthonous thinking and dissociation of thought and affect; very frequent and very bizarre delusions and hallucinations and a marked disintegration of personality.

Atypical (*Schizophreniform*) *Schizophrenia*. The general features of schizophrenia are present but the symptoms described under Typical (Process) Schizophrenia, if present at all, are ephemeral in duration, mild in intensity and tend to be episodic rather than persistent. They are tempered by such atypical symptoms as a reasonable degree of extraversion and sociability, a tinge of cyclothymia; a preservation of personality, which, prior to the illness, enabled the individual to face life's problems with average success.

A thorough survey of the literature regarding prognosis (Blair, 1940; Mayer-Gross *et al.*, 1954) shows that the following points are significant.

Prognostically unfavourable are: a markedly schizoid introverted temperament; a pre-psychotic personality of poor calibre which has dealt with life's problems and difficulties by fantasy and derealistic thinking; a gradual insidious onset; the absence of any precipitating factors; the presence of "process" symptoms (see above); a typical asthenic build; a pronounced hereditary taint of psychosis. (The significance of this last item is disputed.)

Prognostically favourable are the exact reverse of these characteristics, namely: a cyclothymic temperament; dealing with problems directly and competently; a sudden onset; precipitation by an obvious exogenic factor; the absence of process symptoms; a pyknic build and the absence of hereditary taint; the presence of any manic depressive symptoms.

Regarding typology it is said that the following is the prognostic order from best to worst—catatonic, paranoid, hebephrenic, simple.

The prognosis is in any patient inversely proportional to the duration of his (or her) illness and length of his (or her) hospitalization which may indeed be considered the most important of all prognostic factors.

Needless to say many cases must be deemed to be indeterminate regarding some of the symptoms and characteristics mentioned above.

THE MATERIAL

The case material used in the first three phases of our work consisted exclusively of women suffering from "typical" chronic schizophrenia of many years' standing. The ages of these patients at the beginning of our investigation varied from 19 to 59 years and the time during which they had remained continuously in hospital was from five to thirty-five years. The scatter is shown in Table I, 3.

The patients were housed in two top floor wards having 33 side rooms and 77 dormitory beds between them.

Every patient in each ward was subjected to group habit training and thus a total of 110 patients was involved.

Our knowledge of the propensities of the tranquillizing drugs was meagre when we embarked on investigating the comparative therapeutic merits of chlorpromazine and reserpine and so some of the physically less robust patients were at that stage deemed unsuitable for this investigation. A final selection of two groups of 46 patients of approximately similar ages and prognostic calibre was made, one group to be treated by chlorpromazine and the other by reserpine. Section II therefore concerns only a total of 92 patients.

As a result of chlorpromazine therapy a number of patients were discharged from these wards to their homes or to unrestricted open wards in the hospital. The consequent vacancies were filled by other chronic patients of a similar type. This procedure accounts for the fact that the total number of cases treated in the third phase of our work was 132.

Table I

Prognostic Details of the 132 Female Chronic Schizophrenics Forming the Material of Sections I, II and III

1.—*Age at Commencement of this Investigation*

Years ..	10–15	15–20	20–25	25–30	30–35	35–40	40–45	45–50	Over 50
No. of patients ..	0	2	3	5	24	26	27	22	23

2.—*Age at Onset of Illness*

Years ..	10–15	15–20	20–25	25–30	30–35	35–40	40–45	45–50	Over 50
No. of patients ..	4	17	35	29	24	14	6	3	0

3.—*Duration of Hospitalization*

Years	5–10	10–15	15–20	20–25	25–30	Over 30
No. of patients ..	55	36	19	5	3	4

4.—*Heredity*

No. of cases with a positive history of hereditary psychosis	32
No. of cases not known	25

5.—*Typology*

Catatonic	15
Paranoid	48
Hebephrenic	22
Simple	10
Indeterminate	27

6.—*Previous Treatments*

E.C.T.	Deep Insulin Therapy	Leucotomy	None
48	36	18	58

DEFINITIONS OF GRADES OF RECOVERY AND IMPROVEMENT APPLYING TO TABLES II, III, IV AND V.

No figures in tabular form can portray exactly the changes that have taken place in the patients treated, and it is only accurate definitions of the graded results that give a proximate assessment. No standard series of grading definitions has ever received general acceptance. In defining our grades, the following aspects were considered of paramount importance.

(*a*) The degree of improvement or recovery in psychotic symptoms.
(*b*) Behaviour and adjustment to environment at home or in hospital.
(*c*) Working capabilities.
(*d*) Dependence on support and supervision of relatives or nursing staff.

We found that these four items were clinically closely related.

Our definitions are as follows.

Full Recovery

A recovery from all psychotic symptoms and a return to pre-psychotic personality. Good insight into their illness.

An ability to establish satisfactory relationships with relatives and friends within normal bounds.

A resumption of their pre-psychotic employment or employment of a similar calibre. Reasonable responsibility and reliability, and no abnormal dependence on relatives and friends.

Social Recovery

A recovery from manifest psychotic symptoms but with some "scarring of personality" and lack of full insight into their illness. Well behaved with an ability to adjust themselves fairly satisfactorily to their environment.

A capacity for resuming work of an approximately similar category to that before their illness though not quite so efficiently.

The only support needed from relatives, friends or nursing staff is tact and understanding with a few allowances for residual petty peculiarities.

Much Improved

No overt serious or gross psychotic symptoms but with manifest considerable scarring of personality and residual psychotic symptoms of a minor degree.

Well behaved (apart, in some cases, from brief episodes when they are difficult) and with an ability for adjustment to a favourable congenial environment but an inability to cope adequately with adverse or uncongenial circumstances.

Their working capacity is impaired and limited to work of a more simple type than before admission although this they can perform usefully.

They require a sheltered environment at home or in the hospital and care and consideration from relatives, friends or nursing staff amounting to definite continuous support of a minor degree.

Improved

Patients who still suffer from serious psychotic symptoms such as delusions and hallucinations although these are diminished in intensity and severity.

Their behaviour has improved and their social conduct is satisfactory but they have a limited capacity to adjust themselves to any environment other than that to which they are accustomed. They are allowed the freedom of the hospital grounds on their own.

They are capable of simple manual and occupational tasks under some supervision.

They require a moderate degree of support from the nursing staff.

Slightly Improved

Chronic schizophrenics whose psychoses remain virtually unchanged except that the symptoms become less intense. They become more amenable to strict supervision and care by the nursing staff and given this their behaviour improves. They do not reach the stage when they are fit to be granted freedom of the hospital grounds on their own.

No Change

Patients whose psychoses and behaviour do not respond to therapy by any noticeable change.

Worse

Patients whose psychotic condition becomes worse from the effects of the therapy concerned.

Dead

Patients whose death is directly attributable to the treatment received (e.g. leucotomy and deep insulin).

TABLE II

Showing the Effects of Group Training on Chronic Psychotic Patients

7.—*The General Effects on Psychosis*

Total No. of Patients	Recovery	Social Recovery	Much Improved	Improved	Slightly Improved	No Change	Worse
110	0	2 (1·8)	5 (4·5)	25 (22·5)	60 (54)	18 (16·2)	0

(Percentages in brackets)

8.—*Its Effect on Drug Consumption*

Drugs	Duration of Group Training	At Start	3 Months	6 Months	1 Year	2 Years	4th Year Before Start of Chlorpromazine	Now
Paraldehyde	No. of patients	70	70	32	5	2	0	0
	Consumption in dr. per month	10,500	10,500	3,800	150	20	0	0
Sodium Amytal	No. of patients	24	24	10	10	2	0	0
	Consumption in gr. per month	6,000	6,000	3,600	1,800	24	0	0

Nearly all of the more recent cases in this group had previously been subjected to more than one of the standard therapies (i.e. E.C.T., deep insulin or leucotomy) during their time here. Many others however were admitted during war-time years when the shortage of medical staff and limitations of facilities prevented them from having E.C.T. and deep insulin therapy as they would have done in ordinary circumstances and by the time the deep insulin clinic was functioning again their illness was of such duration that deep insulin was not warranted (see discussion, page 654).

Prognostic Factors

We have already mentioned that the most important single prognostic factors in schizophrenia are the duration of illness and hospitalization. So many patients were admitted at a time when shortage of psychiatric social workers and doctors prevented histories being checked that the duration of their illness prior to hospitalization is not definite. However, this factor is of comparatively little significance when weighed against the very long time they had spent continuously in hospital, which in itself spelled an extremely bad prognosis for them all prior to the commencement of group training and chlorpromazine treatment. The ascertainable prognostic factors of the full series of cases are indicated in Table I and the very serious prognoses prevailing were confirmed beyond doubt for us by our personal observations of their progress over many years. The poor general prognostic picture is further illustrated by the individual case histories at the end of this article.

I.—GROUP TRAINING

Method

Four years prior to our research on the effect of tranquillizing drugs on this series of cases, group training had been commenced in both wards which housed them. The broad principle of this training may conveniently be summarized.

In each ward the total number of patients was divided into four groups. Each group comprised between 10 and 15 patients. The first group was composed of patients with the least duration of illness and the best behaviour, the fourth group of the worst patients in these respects and the other two groups were of intermediate grades. One nurse was placed in charge of each group and it was her duty to supervise group activities and to see that the patients complied with the prescribed routine. A regular programme was arranged for each group with the object of keeping them occupied and interested throughout the day. Regular group walks in the grounds and group attendances at all hospital entertainments, including the weekly dances in the ballroom, were progressively introduced and ward occupational therapy and participation in table tennis and other games was encouraged. Many of the patients were incontinent and a special routine of excretory habit training was of major importance in groups three and four.

Results

The situation in each of the wards prior to grouping was the usual one for mental hospital wards dealing with chronic schizophrenic patients. With few exceptions the patients were difficult to manage, being sullen, solitary and self-preoccupied; often very hallucinated and noisy; sporadically indulging in impulsive, aggressive, destructive and violent behaviour and most of them for the greater part of their time idle and unemployable. Some were in protective clothing because of tearing everything they could lay hands on into shreds. Others spent long spells in side rooms punctuated with periods of seclusion, and the majority of the 33 side rooms were occupied day and night by such patients. They were slovenly in dress and degraded in habits and many of them incontinent. Few of them ever saw any of the hospital grounds outside the walled-in exercise courts. The majority of the patients were receiving massive doses of paraldehyde and other sedatives. The general atmosphere of the wards was noisy, disorderly and depressing and the typical mental hospital aroma emanated from paraldehyde and incontinence. Patients often sat huddled in a corner or wandered aimlessly preoccupied with hallucinations. Many patients were unfit even in their best phases to attend the hospital recreations and entertainments.

TABLE III

Comparative Results from Chlorpromazine and Reserpine

9.—*A Comparison of Chlorpromazine and Reserpine* (*Lasting 6 Months*)

Grade	Chlorpromazine	%	Reserpine	%
Recovery	1	(2·2)	0	
Social recovery	6	(12·4)	2	(4·4)
Much improved	22	(50)	4	(8·8)
Improved	12	(25·4)	20	(44)
No change	5	(11)	12	(25·4)
Worse	0		8	(17·4)
Total	46		46	

(Percentages in brackets)

10.—*The Fate of the 44 Reserpine Patients Subsequently Treated by Chlorpromazine*

Recovery	3
Social recovery	8
Much improved	18
Improved	10
No change	3
Worse	2
Total	44

Group training steadily changed the above picture. Gradually the patients' behaviour improved and their interests were aroused. Their degraded habits and incontinence eventually almost ceased and they appeared much more tidily dressed. It was possible to dispense with the use of all paraldehyde and sedatives (see Table II, 8). The objectionable aroma to which we have just referred disappeared. They learned to dress themselves, wash themselves, use toothpaste for cleaning their teeth and make their own beds, and they took at least a little pride in their appearance. Instead of being idle and unemployable the daily programme assured constant occupation during the mornings and the afternoons and the groups were taken to the hospital entertainments and dances some evenings and encouraged to participate in ward games and recreations on the others. Group gardening activities of a simple nature were introduced. Confinement and seclusion in side rooms became less frequent and eventually entirely unnecessary.

Table II, 7, indicates the total results achieved, but these figures do not really reveal the truly remarkable changes solely attributable to group training. In particular the whole ward atmosphere was transformed and became comparatively quiet, orderly, and pleasant; these general changes naturally having a beneficial effect on each individual patient. The benefits resulting from group training and increased freedom have to be seen to be believed.

Nevertheless, despite the degree of improved behaviour, nearly all the patients remained considerably introverted, self-preoccupied and asocial and their conduct seemed to be performed more or less automatically on the basis of the habits inculcated into them by group training. Approximately 90 per cent. of them remained manifestly hallucinated (frequently chattering to themselves, sometimes noisily) and on occasions prompted to impulsive aggressive outbursts. Grimacings, mannerisms and stereotypies were still to be witnessed in the wards fairly often, although very much less than previously. The patients still seemed to have difficulty in establishing social contacts, and a paucity of emotional feeling and a lack of subjective and objective insight persisted. The schizophrenic process still held the majority of them in a grip of inhibition and stultification.

It should be noted that (in the absence of chlorpromazine treatment) patients soon tend to relapse into their old modes of behaviour if the nursing staff do not consistently supervise group activities.

TABLE IV

Results from Chlorpromazine Therapy of Chronic Schizophrenic Patients

11.—*Clinical Results*

	Years in Hospital					
Grade	5–10	10–15	15–20	Over 20	Total	
Recovered (C) ..	6	4	1	0	11	(8·3)
Social recovery (C) ..	25	4	4	1	34	(25·8)
Much improved (C) ..	26	16	4	4	50	(38·3)
Improved (C) ..	5	9	6	3	23	(17·4)
No change	3	1	4	4	12	(9)
Worse	1	–	–	1	2	(1·5)
Total	66 (48·6)	34 (25·8)	19 (15·7)	13 (9·8)	132	

(C)=Controlled by maintenance doses (see text).

(Percentages in brackets)

12.—*Results in Relation to Maximum Dosage, Duration of Treatment*

Grade	Mgms. per Day				Duration of Treatment in Months			
	300	600	900	1,200	0–6	6–12	12–18	18–34
Recovery (C)	11	–	–	–	5	1	1	4
Social recovery (C)	24	8	1	1	12	9	5	8
Much improved (C)	18	20	8	4	4	8	4	34
Improved (C)	11	7	3	5	3	8	1	16
No change	4	4	0	1	–	–	–	9
Worse	2	–	–	–	2	–	–	–

(C)=Controlled by maintenance doses (see text).

13.—*Duration Remissions or Improvements Have Endured in Months*

Grade	0–3	3–6	6–12	12–18	18–24
Recovered (C)	—	–	1	3	7
Social recovery (C)	—	3	3	9	19
Much improved (C)	—	6	11	18	15
Improved (C)	—	2	10	8	6

(C)=Controlled by maintenance doses (see text).

14.—*Results According to Typology*

Grade	Catatonic	Paranoid	Hebephrenic	Simple	Indeterminate
Recovery	7 (28)	3 (7·5)	1 (2·2)		
Social recovery	9 (36)	15 (37·5)	8 (17·6)		2 (22)
Much improved	6 (24)	18 (45)	18 (39·6)	6 (49·8)	2 (22)
Improved	3 (12)	2 (5)	14 (30·8)	4 (33·2)	3 (33)
No change		2 (5)	4 (8·8)	1 (8·3)	2 (22)
Worse			1 (2·2)	1 (8·3)	
Total	25	40	46	12	9

(Percentages in brackets)

15.—*Showing the Frequency of Side Effects on Both Chronic and Recent Schizophrenics Treated by Chlorpromazine*

Complication or Side Effect	132 Chronic Cases		124 Recent Cases		Total	
	No. of Cases	Per cent.	No. of Cases	Per cent.	No. of Cases	Per cent.
Cardiovascular System						
Persistent tachycardia	5	4·0	2	1·6	7	2·8
Dizziness	10	8·0	20	16·0	30	12·0
Syncope	4	3·2	—	—	4	1·6
Alimentary System						
Dry mouth	44	33·3	60	50·0	104	44·0
Constipation	80	64·0	70	56·0	150	60·0
Diarrhoea	6	4·8	1	0·8	7	5·6
Urinary System						
Incontinence (transient)	5	4·0	—	—	5	2·0
Polyuria	20	16·0	10	8·0	30	12·0
Endocrine System						
Amenorrhoea	13	10·4	40	32·0	53	21·2
Lactation	2	1·6	—	—	2	0·8
Glycosuria	1	0·8	—	—	1	0·4
Haemopoietic System						
Leucopenia (below 3,000 c.mm.)	2	1·6	—	—	2	0·4
Agranulocytosis	Nil		Nil		Nil	
Eosinophilia	30	24·0	25	20·0	55	22·0
Raised E.S.R.	40	32·0	45	36·0	85	34·0

Respiratory System						
Nasal stuffiness	10	8·0	12	9·6	22	8·8
Dyspnoea	1	0·8	1	0·8	2	0·4
Central Nervous System						
Signs of Parkinsonism .. .. (rigidity and salivation)	80	64·0	35	28·0	115	46·0
Motor restlessness	25	20·0	10	8·0	35	14·0
Torsion spasm	—	—	1	0·8	1	0·4
Oculogyric crises	6	4·8	—	—	6	2·4
Chorea-athetoid movements ..	1	0·8	—	—	1	0·4
Tremor	15	12·0	5	4·0	20	8·0
Toxi-confusional states	2	1·6	—	—	2	0·8
Hypothermia	1	0·8	—	—	1	0·4
Epileptic seizures	1	0·8	—	—	1	0·4
Other Complications and Side Effects						
Increased anxiety (initial) ..	10	8·0	15	12·0	25	10·0
Initial pyrexia	4	3·2	10	8·0	14	5·2
Jaundice	2	1·6	2	1·6	4	3·2
Blurring of vision	15	12·0	25	20·0	40	16·0
Gross increase in weight ..	5	4·0	3	2·4	8	3·2
Persistent aching in legs and back	2	1·6	—	—	2	0·8
Rashes	15	12·0	10	8·0	25	10·0
Persistent itching	10	8·0	4	3·2	14	5·2
Photosensitivity	Only on exposure to sunlight					
Drowsiness and lethargy ..	120	96·0	115	95·4	235	95·7

II.—A COMPARISON OF CHLORPROMAZINE AND RESERPINE

Prior to commencing this investigation two things were apparent from the literature on the tranquillizers.

1. That chlorpromazine and reserpine can influence schizophrenic cases beneficially, and

2. That each of them produces many side effects, some of which may be unpleasant, debilitating and even dangerous.

There were so many discrepancies in the various reports regarding the methods of their application, the frequency of side effects and the therapeutic results obtained that we decided to ignore them and experiment for ourselves in the usage of these drugs.

Method and Results

Our preliminary objective was a comparison of these two tranquillizers. The material we used was composed as stated above, of two groups each of 46 chronic female schizophrenics, approximately equivalent in duration of hospitalization and prognosis. All of the 92 patients had previously received group habit training for three or four years.

The group having chlorpromazine were put on a dosage of 100 mg. t.d.s. each and the one having reserpine on 2 mg. t.d.s. each. The progress of all patients was observed for a period of six consecutive months during which dosage was never increased and only decreased in the few cases who became worse mentally or developed intolerable side effects.

The results which had been effected by the end of this period (six months) are recorded in Table III, 9. These clearly favour the therapeutic potentialities of chlorpromazine. It had originally been intended at this juncture to change the chlorpromazine patients to reserpine and vice versa. However in view of our findings we decided to transfer those patients on reserpine to chlorpromazine (other than the two "social recoveries") but to refrain from the reverse change, and instead to raise the dosage of chlorpromazine to higher doses in all patients in that group who had not attained "recovery" or "social recovery". Further improvement occurred from both of these procedures. The effect of six months' chlorpromazine therapy on the patients previously on reserpine is represented in Table III, 10 and this further confirmed the therapeutic superiority of chlorpromazine.

The side effects of these two drugs were of interest, the usual side effects of chlorpromazine (see later) occurred in many cases but apart from the major effects which responded to a reduction of dosage they did not prove very troublesome. The side effects from reserpine although less numerous were more severe and obnoxious and Parkinsonian symptoms were more frequent and manifestly more pronounced than on chlorpromazine. Many patients on reserpine developed a very unpleasant feeling of irritability, agitation and general mental discomfort (which they found difficult to describe but about which they complained bitterly) and some became depressed. These symptoms usually cleared up on a reduction of dose but in eight patients who became mentally "worse" treatment had to be terminated altogether.

Case Reports

Case No. 1

Eldest of three sisters; mother died from mitral stenosis when patient was 16, father committed suicide a week later. Brought up by uncle—ex-Regular Army Colonel—disciplinarian. Patient very unhappy and became estranged from uncle and sisters. Came to London. Domestic work then nursemaid. Aged 26 sudden outburst of psychotic excitement followed by short stupor. Then delusions and hallucinations—"going to be pursued and killed", screamed for a bible and the police. Admitted to this mental hospital December, 1941—Catatonic Schizophrenia. Given E.C.T. Improved but soon relapsed –giggling, manneristic, impulsive, faulty in habits, often hallucinated. Periodic stupor and flexibilitas cerea. Occasional catatonic excitement. 1946 prognosis considered very bad. No material change until 31 July, 1955 when chlorpromazine started on 25 mg. t.d.s. and raised to 100 mg. t.d.s. plateau. Parkinsonism. Dose reduced. Stepped up again. First went for a day's leave c/o aunt 12 May, 1955. Ground parole granted 21 June, 1955. Dose increased to 200 mg. t.d.s. with thyroid gr. 1 t.d.s. Further improvement. 28 January, 1956 town parole. June, 1956 patient apparently recovered. Weight increased from 7 stone 4 pounds to 8 stone 10 pounds during treatment; is now 8 stone 5 pounds. Maintenance dose 25 mg. t.d.s. September, 1956 commenced factory work and has been employed there continuously ever since and remained mentally free from any psychiatric abnormality. Is cheerful, sociable, happy, tidy and smartly dressed. Has a room of her own in workers' block. Aunt is dead: has no home to which she can proceed. Is happy here and wishes to remain here. Made a voluntary patient June, 1957.

Summary: Severe catatonic schizophrenia. In hospital continuously for fourteen years before chlorpromazine treatment. By the time she had received treatment for eighteen months had recovered and has remained thus for the subsequent fifteen months.

Case No. 2

Admitted in October, 1949 aged 31 years as a voluntary patient. Youngest of 7 siblings. Fairly happy and normal childhood. Fair employment record. Rather reserved and introverted. Married at age of 19. Quite happy marriage. No children but one stillbirth years before admission. Depressive illness responding to E.C.T. then a month before admission became depressed again.

On admission deluded, hallucinated, depressed. Suspicions of husband's fidelity. Condition insidiously developed into a typical paranoid schizophrenia and she had to be certified. Given further courses of E.C.T. but with little effect. Condition steadily deteriorated. Became sullen, morose, disdainful, suspicious, evasive, hostile, abusive, impulsively aggressive and violent. Very deluded and hallucinated; frequently attacked other patients, accused people of afflicting her with wireless waves. Developed the delusion that she was not married to her husband and became hostile to him. Increasingly more detached from reality. Recalcitrant to all treatment and her condition was by all ordinary prognostic tenets utterly hopeless.

In March, 1955 she was put on chlorpromazine 100 mg. t.d.s. Dramatic improvement and within three months was going home for week-ends with her husband. Dosage continued. The changes effected were truly remarkable. She became spontaneous, reasonably vivacious, cheerful, friendly and free from all schizophrenic symptoms. Sent home October, 1955. Social recovery. Maintenance dose 25 mg. t.d.s. Has remained well ever since.

Summary: Paranoid schizophrenia, steady deterioration during six years of hospitalization. Temporary slight improvement from E.C.T. Rapid "social recovery" on chlorpromazine.

Case No. 3

Was admitted here as a certified patient, aged 20, in April, 1939, suffering from a schizophrenic illness. She was always a very difficult child, untruthful, disobedient and strong-willed. At the age of 12 sent to child guidance clinic. At the age of 17 first developed delusions. Her illness thereafter developed gradually until certification became necessary. In hospital presented a picture of typical schizophrenia: impulsive, aggressive, destructive and hallucinated, etc. In 1941 she had a course of Cardiazol treatment which produced a considerable improvement, but she soon relapsed and deteriorated further. Frequently secluded. Leucotomy operation April, 1946. Condition improved but still far from well. Emotional reactions still shallow. Judgment poor. However, became fit for occasional week-end leave of absence in the care of her mother. Still hallucinated and sometimes impulsive and aggressive. Chlorpromazine treatment commenced March, 1955. Soon improved. By July, 1955 quite co-operative and working in the laundry. Improvement continued. Gained much weight; chlorpromazine discontinued September, 1955, because of this but reinstituted later with thyroid gr. 1 t.d.s. Town parole, January, 1956. Sent home on trial April, 1956. Discharged May, 1956. Social recovery. Since then has made very satisfactory progress. Obtained consistent employment. Free from any psychiatric symptoms. Cheerful, happy, well behaved. Mother finds no difficulties with her.

Summary: Chronic hebephrenic schizophrenic; very bad prognosis. Behaviour improvement from leucotomy. Social recovery from chlorpromazine treatment 9 years later.

Case No. 4

A 45-year-old woman who was first admitted on certificate in 1936.

Family history: Mother is described as a jolly, hard-working woman who often came home drunk. Father got a separation order and custody of the children in 1921 because his wife was going with other men. Patient is third of a family of six children. She left school at fourteen years, was coat machinist for five years, then worked in an artificial flower factory. Is described as always being highly strung, self-willed, high minded and liked being alone. Shortly before admission began to behave strangely, said she was being followed by detectives and was being shot at from cars. On admission she was deluded and hallucinated; was manneristic; smiled and giggled fatuously and inappropriately and had a very flattened affect. Two years later she is noted as being dull, apathetic, hostile, noisy and full of mannerisms. In 1953 she is noted as being stuporose and inaccessible, but subject to outbursts of violence, and as being degraded in her personal habits. In 1954 she is still withdrawn and inaccessible and in a state of marked deterioration. "Slight improvement" with group training.

Chlorpromazine therapy (100 mg. t.d.s.) was started in June, 1955. Within three months her noisy, violent outbursts had stopped, she ceased to be incontinent day and night, she came out of her preoccupied inaccessible state and began to take an interest in things around her.

She was then noted to be getting cyanosed and dyspnoeic on exertion; she had put on a great deal of weight and her hair and skin were dry and scaly. Serum cholesterol was 200 mg. per 100 ml. Chlorpromazine was reduced to 50 mg. t.d.s. and thyroid gr. 1 t.d.s. started. Further improvement was seen within a month and one year later she was observed to be bright, cheerful, co-operative, sociable; she had no delusions or hallucinations; she could give a good account of herself before her illness, but had a complete amnesia for the period of the illness—21 years. She retains fairly marked scarring of her personality, enough to prevent her getting outside employment, but she could live with relatives on a maintenance dose of 50 mg. t.d.s. She was made a voluntary patient in August, 1957. Weight had returned to her normal.

Summary: A chronic schizophrenic, 20 years in hospital. Prognosis appeared hopeless. On chlorpromazine 100 mg. t.d.s. very excessive gain in weight. "Much improved" on chlorpromazine 50 mg. t.d.s. and thyroid gr. 1 t.d.s. Total amnesia for her illness.

Case No. 5

A 20-year-old girl who was first admitted as a voluntary patient at the age of 15 years. No family history, but both parents of low intelligence, but devoted to patient. Three other children in family—all now married. Patient's upbringing uneventful, but her school progress was very slow and she was sent to an E.S.N. school at the suggestion of the local authorities. She gave no trouble until her breakdown at 15 years. She was described as having a happy disposition. During the school holidays began to behave strangely and her talk became rambling and confused. On admission (at 15 years) was extremely manneristic, grimacing, giggling and hallucinated. Deep insulin produced improvement but when it was terminated she relapsed. Prognosis considered extremely bad. Parents took her home against advice. Re-admitted 18 months later on certificate. Again manneristic and grinning and grimacing inanely, her conversation incoherent and irrelevant, aurally hallucinated. She had been like this for her 18 months at home. Poor prognosis confirmed.

Started chlorpromazine 100 mg. t.d.s. March, 1955. Good response, all psychotic symptoms cleared, dose reduced to 25 mg. t.d.s. and patient discharged on prolonged trial June, 1955. August, 1955 chlorpromazine discontinued. February, 1956, relapsed, same picture as before, chlorpromazine therapy re-instated, good response and again sent on prolonged trial in June, 1956, with maintenance dose of 50 mg. t.d.s. Chlorpromazine discontinued in February, 1957. Relapsed again in May, 1957—very acutely schizophrenic with incoherent speech, mannerisms, grimacing, inane giggling and marked aural hallucinations. Chlorpromazine therapy restarted and a rapid amelioration of her condition again took place. Discharged August, 1957 and will remain indefinitely on a maintenance dose of 50 mg. t.d.s.

Summary: A defective schizophrenic of extremely poor prognosis who relapsed on several occasions, but has always responded to chlorpromazine.

III.—The Effect of Chlorpromazine on Chronic Schizophrenia

After the preliminary comparison between chlorpromazine and reserpine (described above) which favoured chlorpromazine we concentrated on that drug alone. Our objective now was to formulate from our own investigations and observations a basic method of administration producing the most efficacious therapeutic results. The details regarding the material used are given above and their prognostic traits indicated in Table I, 1–6. As already stated, all cases were female chronic schizophrenics.

Our work on these patients may roughly be divided into two stages. During the first twelve months we felt our way forward cautiously, experimenting in variation of dosage and in measures to counteract the various side effects which occurred. By the end of this time we had devised in broad principle a method which we applied during the following two years.

Method

We commenced by placing all of the 110 original patients on 100 mg. of chlorpromazine three times a day.

Although the therapeutic results achieved on this dose were impressive (see page 639) some of the usual side effects associated with this drug (see page 641) were experienced by most patients. At this time we dealt with severe side effects by reducing the dosage, which invariably relieved them but produced a concomitant relapse in the patients' mental conditions. Moreover when we raised the dosage in the patients who had not responded well to 300 mg. per day, the problem of side effects and complications became more prominent and worrying. The major reactions concerned were:

(*a*) Symptoms akin to Parkinson's disease—including in particular muscular rigidity and tremors.

(*b*) Motor restlessness.

(*c*) Drowsiness, inertia and lethargy.

(*d*) Gross increase in weight and adiposity.

(*e*) Skin reactions.

(*f*) Jaundice.

By experimenting with various accessory drugs and precautions we managed to counteract the side effects to an extent that allowed us to use the drug in its optimum dose for the optimum period in most of our patients and finally we formulated the following scheme for its administration:

If the illness is acute or the patient is very disturbed, a course of E.C.T. (modified by Pentothal and Brevidil) is given prior to commencing chlorpromazine. (Injections of chlorpromazine were never given to our schizophrenic patients.)

The medication is governed by what may conveniently be termed the "incline and plateau system", the incline referring to a period during which the dose is steadily increased and the plateau to one during which the same dose is maintained. The idea is represented diagrammatically in Diagram I.

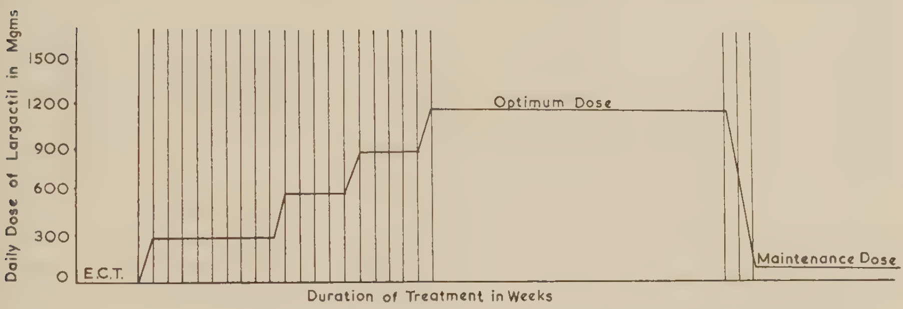


DIAGRAM. 1.—Basic method of treatment for a case requiring 1,200 mg. per day.

Every case is started on 25 mg. of chlorpromazine t.d.s., each dose being raised by 25 mg. t.d.s. until the stage is reached where they are receiving 100 mg. t.d.s. (i.e. 300 mg. per day). The dose is maintained at that level for an indefinite period depending on the patient's progress. In those patients who fail to improve, or improve to some degree but then remain stationary despite all other therapeutic measures (for a span of not more than eight weeks), the dose is increased by 25 mg. t.d.s. until a dose of 200 mg. t.d.s. (600 mg. per diem) is reached. The dose is then again retained at a constant level. Similar provisos govern further rises of dose to levels of 900 mg., 1,200 mg. and 1,500 mg. per day. We did not raise the dose beyond 1,200 mg. per day in any chronic case, but one recent case had it raised to 1,500 mg. (See Case History No. 9).

We found that as a general principle an increase in the amount of chlorpromazine given produces an increase in the patient's improvement up to a certain level—"*the optimum dose*". Any increase of chlorpromazine above this level does not effect any further improvement, but any decrease is followed by some relapse in the patient's mental condition. "*Standardization*" means the establishment of what appears to be the maximum improvement attainable on such a firm basis that reduction of dosage to the maintenance dose level does not precipitate any relapse.

Having established the "optimum dose" for any patient, the time necessary to effect standardization varies from a few weeks to many months. Only very careful observation of the patient's progress and clinical judgment based on much experience enables the psychiatrist to determine when this stage has been reached. Thereafter the dosage is reduced rapidly to a maintenance dose which is usually 100 mg. t.d.s. or 50 mg. t.d.s. but occasionally doses of 200 mg. t.d.s. or 25 mg. t.d.s. are the most suitable. In chronic cases maintenance doses must be continued indefinitely and probably permanently in most of them.

The above scheme represents the broad principles of dosage but we cannot stress too strongly that each case is a special problem, that variations in the above procedure in the light of the patient's progress are often essential and that the most skilful manipulation of medication and the most apt use of ancillary measures by the doctor in charge of the cases are imperative.

Examples of this necessity for variation of the dosage scheme are seen in (1) the inability of some patients to tolerate doses of more than 75 mg. t.d.s. or 50 mg. and (2) the fact that mental defectives were found to be more susceptible to both the therapeutic effects and side effects of chlorpromazine than other patients and to require smaller doses.

In the early days of treatment blood pressure readings are taken every day, but once the phase of hypotension has disappeared are omitted unless specially indicated. A blood count is performed before the commencement of treatment, monthly for the first three months and three-monthly thereafter. Extra blood counts are of course performed if any suspicion of haemopoietic dysfunction arises. For the first four weeks of treatment the temperature is taken twice daily and thereafter discontinued. Weekly weighings are made throughout the whole course of treatment.

The onset of Parkinsonian symptoms is the signal for the introduction of Artane or Pipanol 5 mg. t.d.s. and this medication is continued until chlorpromazine is reduced to a maintenance dose. Thyroid is commenced when lethargy and sleepiness develop, usually about the second or third week, and is also continued until the reduction of chlorpromazine to the maintenance doses —in the majority of cases the most effective dose is gr. 1 t.d.s. Thyroid tablets combined with appropriate dieting are also used to counteract excessive gain of weight.

Antihistaminics are used as skin lesions become manifest and continued until they have disappeared for a few weeks. Occasionally a recurrence necessitates further use of these drugs. Phenergan, Anthisan, or other preparations may be used.

When a patient's progress unaccountably remains stationary for a fortnight or more or when a patient develops a phase of depression, a course of modified E.C.T. (i.e. with Pentothal and Brevidil) is given. The morning dose of chlorpromazine is omitted on the days when the patient is having E.C.T.

It is essential to do everything possible to arouse the patients' interests, increase their confidence and diminish their preoccupation with their symptoms. To this effect the medical and nursing staff do their utmost to induce the patients to take part in the occupational and recreational facilities of the hospital. Relatives and friends who may previously have only visited occasionally, or not at all (because of the patient's deteriorated condition), are contacted and encouraged and persuaded to come and see her regularly.

Once the psychosis has been relieved sufficiently for the patients again to resume contact with the outside world, wherever possible they are taken out by relatives or friends, first of all for a few hours and then for progressively longer periods up to three or four days at a time and thereafter they are discharged to their care. When the patients leave hospital a careful follow-up is undertaken by our psychiatric social workers and by one of us. The relatives and patients greatly appreciate the support of the social workers in the early stages of their return home. Everything possible is done to assist patients to return to remunerative employment. In the "much improved" group who return to their homes it is necessary for the social worker to keep in contact with the patient and relatives for a lengthy period and sometimes indefinitely. Each psychiatric social worker works in collaboration with the doctor concerned, who himself sees the patient at regular intervals of once a month or, where necessary, more often.

On her discharge from hospital the patient's general practitioner is written to and informed and he is exhorted to increase the maintenance dose appropriately at the first sign of a relapse, and to continue it until the symptoms disappear. Severe relapses are re-admitted to hospital with the minimum of delay for a further course of chlorpromazine therapy.

Finally, it is essential throughout treatment to pay the greatest attention to the patient's physical health. Vitamin therapy, extra articles of diet, etc., must be given as indicated.

Results

The *clinical results* originating from our treatment of the 132 chronic patients are portrayed in Table IV, 11, and speak for themselves. Table IV, 12, reveals the total results in relationship to the dosage and duration of treatment, and Table IV, 13, the period during which the results obtained have so far endured. Table IV, 14, records the results in relation to typology.

The results obtained in this group of chronic, apparently irredeemable, schizophrenics are remarkable to say the least.

It must be understood that all patients in the various grades of recovery and improvement are at present still on maintenance doses of the drug. It may therefore be argued justifiably that no cures were effected, since the results were controlled by maintenance doses. We have placed a capital C (C) in the tables to indicate the number of cases on such doses. Nevertheless the results do conform strictly to the definitions provided and the maintenance doses are merely prophylactic against relapses.

One of the most remarkable features to be witnessed was seen in patients who, prior to treatment, were apparently in a state of advanced intellectual deterioration. A number of these patients appeared to recover their intellectual faculties completely and return almost, if not entirely, to their pre-psychotic state. Some had a complete amnesia for the whole of their illness (see Case No. 4). Some had a partial amnesia, and others remembered most of the events in their environment during the whole of their illness but did not remember fully the details of their psychotic symptoms and behaviour.

The ultimate results and disposal depended very much on the patient's pre-psychotic personality and general prognosis, and upon her home circumstances. Once the psychosis had been dispelled, typical pre-schizophrenic personality traits were revealed, with the characteristic emphasis on introversion, shyness, unsociability and rather shallow emotional reactions. Whether patients remained well at home was largely consequent on the attitudes and reactions of their relatives.

Because some cases who had attained the grade "Recovery" or "Social Recovery" had no home or friends to whom they could proceed, they had to remain in hospital, but ordinary trades and occupations in the neighbouring industrial area with full salary scales were found for them and they journeyed backward and forward from the hospital to their work each day. Some patients in the "Much Improved" grade were able to remain at home because they obtained the necessary support and supervision from relatives and those remaining in hospital all had full freedom of the hospital grounds and surrounding towns. All the "Improved" group remained in hospital and were allowed to come and go in the hospital grounds as they wished, but could not proceed to the nearby towns. The "No Change" group had previously improved sufficiently as a result of group and habit training to be in open wards, but showed no further beneficial change from chlorpromazine therapy. In two cases chlorpromazine treatment had to be terminated because the patients became very confused. When this symptom arose chlorpromazine was withdrawn, but after the confusion had disappeared was re-introduced. In both patients confusion returned and therefore treatment by this drug was abandoned. These patients were both in the highest age group. They are recorded in the grading as "Worse" but actually soon recovered to their usual condition when chlorpromazine was withdrawn.

It was our experience that as patients improved they progressed through the grades described and contrary to some writers (Lomas, 1956; Pollack, 1955) who have differentiated between improvement in "Behaviour" and improvement in "Psychosis" we believe that these two entities are closely interwoven and related and not to be differentiated, as far as reactions to chlorpromazine itself are concerned.

Relapses occurred in 25 per cent. of discharge cases. However, it was gratifying to find that these relapses responded so well to a further course of chlorpromazine treatment that they were invariably before long restored to the same mental state as that present before the relapse.

The relapses were attributable to three different causes:

1. The characteristic sporadic and protean variations in the course of any schizophrenic illness, resulting in periodic phases when symptoms worsen and the mental condition relapses.
2. Failure on the part of the patient to take her maintenance dose of chlorpromazine.
3. Unsatisfactory domestic circumstances, for instance intense loneliness in married women left alone while their husbands are out at work.

The first cause was dealt with by another course of chlorpromazine, the second by ensuring that maintenance doses were taken regularly and we eventually decided that it was necessary for all patients of this chronic type to remain on maintenance doses indefinitely, and the third by redoubled efforts to help the patient to obtain social contacts, and, where feasible, part-time or whole-time employment.

In the "Improved" grade it was interesting to observe the changes from chlorpromazine supervening on those already obtained from group training. The patients became less introverted and less automatic in their behaviour. They now seemed to know and appreciate what they were doing. They became much more friendly and talkative to the staff and other patients. Manifest hallucinations with accompanied chattering, noisiness and impulsiveness diminished remarkably from 90 per cent. of the patients to 10 per cent. and even when this symptom persisted the patients were enabled to adopt a comparative indifference to it. Grimaces, mannerisms and stereotypies instead of appearing quite often now became extreme rarities. While there was a certain air of "sans souci" in most patients, they appeared to be able to enjoy both work and play more wholeheartedly. Their interest and satisfaction in their work increased and many patients still in hospital became useful workers in the hospital infirmary wards, nurses' home, the laundry and even the patients' typing pool.

The transformation in the general atmosphere of the wards was noteworthy. They now presented an air of comparative cheerfulness, purposefulness and hopefulness. The use of locks and keys was abandoned once and for all and the conditions became more like those of a modern general hospital than those persisting in the same wards before the introduction of group training and chlorpromazine.

These results were not easily achieved. Some patients responded to chlorpromazine rapidly, but others required many months before the maximum improvement was reached.

The most valuable effect of the drug was to render patients amenable to the various measures of occupation and recreation. The chronic and demented schizophrenic did not disappear completely from the wards. However, where schizophrenia did persist it almost invariably did so in a minor pianissimo compared with the major crescendo existing previously.

Previous failure to respond to treatment by E.C.T. or deep insulin did not have any prognostic significance for results from chlorpromazine but once the psychotic reactions were dispelled any detrimental effect on the personality resulting from a previous leucotomy operation was apparent. In some of them when the schizophrenia had disappeared, one was confronted with the task of dealing with a typical post-leucotomy syndrome. We found that previous leucotomy could be deemed a factor likely to impede the maximum benefits from chlorpromazine.

Patients who remained in a stationary phase often derived much benefit from a course of E.C.T. Three patients during a course of chlorpromazine treatment, for unknown reasons, suddenly developed agitation and depression; they all responded well to E.C.T.

In our experience E.C.T. was a very valuable adjuvant to chlorpromazine therapy. In not a single instance did chlorpromazine therapy cause a complication or the slightest untoward effect during any E.C.T. treatment (chlorpromazine was always omitted on the same morning as E.C.T. was given and E.C.T. was never given more than twice a week).

Side Effects

Table IV, 15, represents the total number of side effects occurring in this series of cases.

Parkinsonian Symptoms. It will be seen that Parkinsonian symptoms occurred in a high percentage of our cases and this was because we found that the optimum dose for any patient nearly always produced such symptoms. The origin of this side effect was not directly dependent on the dose given, occurring often on doses of 300 mg. per day but sometimes not until the dose was increased to 900 or 1,200 mg. per diem. Its advent usually heralded therapeutic response but could also produce much discomfort and disability. Originally we frequently had to reduce the dosage because of these unpleasant effects but found that when we subsequently increased it to the optimum level the symptoms recurred. This was a great disadvantage, since we realized that prolonged treatment on the optimum dose was essential. However, after experimenting with varying doses of Artane and Pipanol (benzhexol hydrochloride) 5 mg. t.d.s. of one or the other of these drugs was found to counteract the Parkinsonian symptoms very satisfactorily. Although the symptoms did not disappear completely, in nearly every case they were so much diminished that they became easily tolerable and did not interfere with the patient's participation in recreational-occupational activities to any serious degree. Examples of the most unpleasant symptoms which were dispelled were: oculogyric crises; the feeling expressed by some patients that their heads were like lead weights which they had to carry around; tremors; muscular rigidity; mask-like expression; salivation and torsion spasms. In the days before we used Artane one of our patients particularly fond of playing the piano was, while on an optimum dose of chlorpromazine, unable to do so because of Parkinsonian muscular rigidity. When she was placed on concomitant Artane her ability to play was restored.

Motor restlessness, which occurred in some patients to such a degree that its victims were hardly still for a moment throughout the day, also responded extremely well to Artane (or Pipanol) and entirely or almost entirely disappeared.

Artane and Pipanol are very safe drugs and were maintained in the dose stated as long as we wished without any untoward side effects. Any residual degree of Parkinsonism persisting despite the effect of Artane invariably disappeared on the reduction of chlorpromazine to maintenance doses.

Drowsiness and lethargy. These side effects were the most frequent of all. Although the type of drowsiness was not unpleasant, it was debilitating and incapacitating. Amongst other pharmacological properties of chlorpromazine is reported to be a reduction of basal metabolic rate. Because of this we decided to try the effect of thyroid. We found that all patients tolerated it remarkably well and after experimenting with the dosage we selected gr. 1 t.d.s. as the most suitable. Fortunately these symptoms which were often very pronounced in early treatment, nearly always decreased to tolerable dimensions. It is impossible to ascertain how much this was due to thyroid medication and how much to an increasing tolerance of the drug or to the effect of Artane, which is a cerebral stimulant. Drowsiness and lack of energy in a minor degree could persist in many patients even after chlorpromazine had been reduced to a maintenance dose of 100 mg. t.d.s., but after a further reduction to 50 mg. t.d.s. it almost invariably disappeared.

Gross increase of weight and adiposity. A gain in weight occurred in all cases who benefited from chlorpromazine, and seemed to reflect the general improvement in their physical conditions. In some cases, however, this assumed gross proportions. Thyroid gr. 1 t.d.s. was used to counteract these symptoms also and from our observation there seemed little doubt that it was sufficiently effective to warrant use in all such cases. However, it often did not in itself produce sufficient control of weight and continued dieting was necessary. Although these measures kept the weight gain within tolerable dimensions, the weight seldom returned to the normal for any particular patient until chlorpromazine was reduced to maintenance doses or withdrawn altogether.

Skin reactions. The antihistaminic drugs were given to combat skin reactions. Morbilliform rashes, erythematous rashes and pruritus responded readily to this treatment. Intense itching which occurred usually after the patients had been on chlorpromazine for several weeks was helped by the antihistaminics but the dose of chlorpromazine had to be reduced in a few cases when excoriation of the skin occurred as a result of scratching. Nearly all patients on chlorpromazine developed sensitization to sunshine but, provided they did not remain in the sunshine for long periods, this seldom produced sufficient discomfort to necessitate any special treatment. When it did become unbearable antihistaminics and soothing lotions were effective.

Other side effects. In this series of cases hypotension was never severe and, once a tolerance for chlorpromazine was established, cleared up, even when it was the result of high dosage.

Our experience showed that the white blood cells usually dropped to 4,000 per cu./mm. If it fell below this level the patient was taken off the drug until the figure increased to normal again. Eosinophilia was recorded in 3 per cent. of cases and the sedimentation rate sometimes rose to 20 mm. in one hour. None of these changes were of any serious significance and disappeared in the course of treatment. No case of agranulocytosis occurred.

It was found that in 15 per cent. of the patients a pyrexia occurred, usually on the 10th day or soon after, and that at this time some patients displayed a marked increase in schizoid delusions and hallucinations and their behaviour became more disturbed. Oddly enough this reaction seems to be exclusive to schizophrenic patients and has not occurred in patients of other diagnoses whom we have treated. We have found this reaction to be prognostically favourable—it wears off within a matter of a few days.

Altogether we had four cases of jaundice. We noted that in each of the first three cases a "second week" pyrexia preceded the onset of jaundice. Once we had established this association we were careful to suspend treatment in every case developing a pyrexia, but commenced it again when the patient had been apyrexial for a few days. After this precaution only one case of mild jaundice developed in any of the chronic patients and no further case of jaundice occurred in the recent group (see Section IV). In the four cases who suffered from jaundice chlorpromazine was re-introduced after the jaundice had disappeared completely and the symptom did not recur.

Amenorrhoea persisted in several cases throughout chlorpromazine treatment until the drug was reduced to maintenance doses.

Lactation was of a very mild degree, producing little unpleasantness or inconvenience, but also persisted throughout the course of chlorpromazine in both patients affected.

In the only patient suffering from glycosuria we suspected diabetes mellitus because the symptoms persisted. Her blood-sugar curve was compatible with diabetes and she was given insulin while chlorpromazine was continued for three months. After the course was completed glycosuria ceased and the blood-sugar curve returned to normal.

One case developed petit mal epileptic fits during her course of chlorpromazine. She was seen by a consultant neurologist and temporal lobe epilepsy was suspected. She had been subjected to numerous E.C.T. therapies in another hospital prior to chlorpromazine here. The condition gradually cleared up completely when the chlorpromazine was reduced to maintenance doses (see Case History No. 10).

The other side effects enumerated in Table IV, 15, seldom caused much discomfort and tended to diminish and disappear as the treatment proceeded and the patients developed a tolerance for the drug. They were treated symptomatically when the need arose. Sometimes the chlorpromazine dosage had to be temporarily reduced to relieve one or another of them.

We believe that Artane and thyroid, apart from the objectives for which they were used, may act in other ways empirically and synergistically. For instance it is known that Artane is pharmacologically a cortical stimulant (see Extra-Pharmacopoeia) and the work of Gjessing (1938) and of Batt *et al.* (1957) is suggestive in the above respects regarding thyroid.

Two other points are worthy of comment. One refers to the large number of hebephrenic patients in our series. This is, of course due to the fact that this type of schizophrenic has a bad prognosis and more hebephrenic cases became patients in our chronic wards than the other types.

Certain cases who left hospital on maintenance doses of chlorpromazine ceased taking this dose because they were concerned about their figures. They resorted to dextroamphetamine and this seemed almost invariably to reactivate their psychoses within a short time. This finding is worthy of note because other writers have advocated the use of dextroamphetamine to combat drowsiness (see Section V—Discussion).

TABLE V

124 Recent Cases Receiving Chlorpromazine Therapy
Showing the Prognostic Factors Prevailing in 84 Typical and 28 Atypical Recent Schizophrenic Cases Treated by Chlorpromazine

16.—*Age at Start of Investigation*

	15–20 Years	20–25 Years	25–30 Years	30–35 Years	35–40 Years	40–45 Years	45–50 Years
Typical process schizophrenia	13 (10·4)	22 (17·6)	16 (12·8)	17 (13·6)	9 (7·2)	5 (14·0)	2 (1·6)
Atypical (schizophreniform)	0	7 (5·6)	9 (7·2)	11 (8·8)	8 (6·4)	3 (2·4)	2 (1·6)

(Percentages in brackets)

17.—*Duration of Psychosis Before Treatment*

	0–3 Months	3–6 Months	6–12 Months	2 Years	3 Years	4 Years	5 Years
Typical process schizophrenia	2 (1·6)	4 (3·2)	30 (24·0)	28 (22·4)	8 (6·4)	6 (4·8)	6 (4·8)
Atypical (schizophreniform)	33 (28)	7 (5·6)	0	0	0	0	0

(Percentages in brackets)

18.—*Other Treatments before Chlorpromazine*

	E.C.T.*	Deep Insulin	Leucotomy	No Other Treatment
Typical	84	32	0	0
Atypical	0	0	0	23

* This applies to full courses of E.C.T. and not E.C.T. as an adjuvant to Chlorpromazine.

19.—*Previous Personality*

	Poor	Fair	Good
Typical schizophrenia	10 (8)	53 (42·4)	21 (16·8)
Atypical (schizophreniform)		7 (5·6)	33 (26·4)

(Percentages in brackets)

20.—*Mode of Onset*

	Insidious	Gradual	Acute
Typical schizophrenia	10 (8)	58 (46·4)	16 (12·8)
Atypical (schizophreniform)			40 (32)

(Percentages in brackets)

21.—*Precipitating and Hereditary Factors*

	Exogenic Factors Present	Positive Heredity
Typical schizophrenia	4 (3·2)	35 (28)
Atypical (schizophreniform)	12 (9·6)	3 (2·4)

(Percentages in brackets)

22.—*Representing the Results Obtained According to Typology*

	Typical						Atypical		
Grade	Indeterminate	Paranoid	Catatonic	Hebephrenic	Simple	Total	Schizophreniform	Total	Total of all Recent Cases
Recovery (C=8)	4	5	6	3	0	18 (21·4)	34 (C=0)	34 (85·0)	52 (41·6)
Social recovery (C=20) ..	9	18	13	4	1	45 (53·4)	6 (C=0)	6 (15·0)	51 (40·8)
Much improved (C=15)	6	7	0	3	1	17 (20·2)	0	0	17 (13·6)
Improved (C=4)	1	2	1	0	0	4 (4·7)	0	0	4 (3·2)
No change	0	0	0	0	0	0	0	0	0
Total	20 (16)	32 (25·6)	20 (16)	10 (8)	2 (1·6)	84	40 (32)	40	124

C=Number of patients still receiving maintenance doses of chlorpromazine.

(Percentages in brackets)

23.—*Representing Results Obtained in Relation to Duration of Illness Before Treatment was Commenced and Dosage Used*

	Duration of Illness							Dosage					
	0–6 Mths.	6–12 Mths.	2 Yrs.	3 Yrs.	4 Yrs.	5 Yrs.	Total	300 mg. Daily	600 mg. Daily	900 mg. Daily	1,200 mg. Daily	1,500 mg. Daily	Total
Recovery ..	29	18	3	1	1		52	22	25	5			52 (41·6)
Social recovery	11	10	15	8	3	4	51	10	33	4	3	1	51 (40·8)
Much improved	0	1	11	0	3	2	17	—	4	6	7	—	17 (13·6)
Improved ..	—	—	3	1	—	—	4	—	1	2	1	—	4 (3·2)
No change ..	—	—	—	—	—	—	—	—	—	—	—	—	—
Total ..	40 (32)	29 (23·1)	32 (25·6)	10 (8·0)	7 (5·6)	6 (4·8)	124	32 (25·6)	63 (50·4)	17 (13·6)	11 (8·8)	1 (0·8)	124

(Percentages in brackets)

24.—*Analysis of the Fate of 57 Insulin Failures Who were Subsequently Treated with Chlorpromazine (in this Series of Cases)*

Recovery	11	(19·2)
Social recovery	20	(35)
Much improved	14	(24·5)
Improved	8	(14)
No change	4	(7)
Total	57	

(Percentages in brackets)

25.—*Representing All the Results Obtained from Deep Insulin Therapy of 112 Female Schizophrenic Patients—1951 to 1955*

	Average Duration in Hospital—3 Years Typical Schizophrenia						Average Duration in Hospital—4 Months Atypical Schizophrenia (Schizophreniform)						
	1951	1952	1953	1954	1955	Total	1951	1952	1953	1954	1955	Total	Total of all Cases
Recovery ..	1	1	0	1	0	3 (3·5)	3	5	2	2	7	19 (67·8)	22 (19·6)
Social recovery	5	2	1	0	2	10 (11·9)	0	1	0	4	1	6 (21·4)	16 (14·2)
Much improved	4	1	2	1	1	9 (10·7)	0	2	0	0	0	2 (7·1)	11 (9·8)
Improved ..	4	8	4	2	2	20 (23·8)	0	0	0	1	0	1 (3·5)	21 (18·7)
No change ..	10	4	11	10	7	42 (50·0)	0	0	0	0	0	0	42 (37·5)
Worse	0	0	0	0	0	0	0	0	0	0	0	0	0
Total ..	24	16	18	14	12	84	3	8	2	7	8	28	112

Total No. insulin patients for 5 years—102. Of these: 12 had a second course of insulin.
45 were discharged and did not relapse: of these 28 were schizophreniform.

(Percentages in brackets)

26.—*Showing Therapeutic Results Obtained from Leucotomy on 82 Female Schizophrenic Patients*

	Duration of Illness at Time of Operation							
	6–12 Months	2 Years	3 Years	4 Years	5 Years	5–10 Years	10–20 Years	Tota
	(Percentages in brackets)							
Recovery ..	1	0	0	0	0	0	0	1 (1·25)
Social recovery ..	0	3	3	0	1	0	0	7 (8·6)
Much improved	0	1	0	1	1	0	0	3 (3·8)
Improved ..	1	4	2	1	3	3	2	16 (19·6)
Slightly improved	4	6	3	1	4	9	3	30 (36·8)
No change ..	2	4	4	2	3	4	4	23 (27·6)
Worse	0	0	0	0	0	0	0	0
Dead	0	1	1	0	0	0	0	2 (2·5)
Total ..	8	19	13	5	12	16	9	82

27.—*Showing Results of Chlorpromazine Therapy on 41 Previously Leucotomized Female Patients in Our Series*

Grade	No. of Cases Before Chlorpromazine	No. of Cases After Chlorpromazine
Recovery	0	0
Social recovery	0	2
Much improved	1	16
Improved	4	14
Slightly improved	20	3
No change	16	6
Total	41	41

CASE REPORTS.

Case No. 6

Admitted aged 34 as a voluntary patient in 1957. Highly intelligent. University lecturer. Good personality; cheerful, sociable and friendly. Successful stable scholastic and employment records. Single, although she had had proposals of marriage. No previous psychiatric disability. Well adjusted to life.

A few months previously a colleague she had been fond of and hoped to marry, married someone else. Work as lecturer and tutor particularly heavy during winter months. She became withdrawn, unsociable and self-preoccupied. Began to hear the voice of a male colleague talking to her pleasantly. Six days prior to admission onset of sudden acute symptoms. Her thoughts were being read on the underground and by a taxi driver. She could read other people's thoughts. Thought she was being followed by a man. Even in her flat she heard him talking. Prostitutes were after her and she was terrified they would give her an injection. On admission decided that the staff were going to sterilize her and smashed a pane of glass next morning because of this. Thought anti-Christ people were torturing her. Affective reactions shallow. Speech slow and deliberate.

Placed on chlorpromazine 100 mg. t.d.s. Condition responded rapidly. One month after commencement of treatment was granted town parole and a month later was discharged home having completely "Recovered". No maintenance dose. Has remained well and free from any psychiatric symptoms.

Summary. Atypical schizophrenia (schizophreniform reaction). Rapid "Recovery" on chlorpromazine.

Case No. 7

A single 27-year-old woman who was admitted on certificate April, 1955. There is no family history, and she has two older brothers and a sister who are married. She lives with her parents, and although she had a good work record was always inclined to be shy, awkward and reserved, with very few social contacts. For three months before admission she had been worrying Scotland Yard and the War Office with frequent telephone calls accusing the Americans of using radium rays on her body, using "a squash roller" on her abdomen and putting rays through the wall of her house. She felt that rays were being used to deform her body and change her sex.

Deep insulin therapy was started, but after two months her mental state showed no response at all. Her delusional system was if anything more florid and more bizarre. The prognosis looked hopeless. Chlorpromazine 100 mg. t.d.s. was commenced and in the next two months little progress was made. The dose was raised to 200 mg. t.d.s. and thyroid gr. 1 t.d.s. was added. Definite progress was noted immediately—her delusions began to fade and she acquired some degree of insight into her illness. This dose was maintained for 3 months and then reduced to 50 mg. t.d.s. She was discharged in April, 1956 on a maintenance dose of 50 mg. t.d.s. She was followed up as an out-patient over the next year. Her chlorpromazine was discontinued after six months. She has remained well for 18 months although she has had no maintenance dose for 12 months.

Summary: A paranoid schizophrenic of bad prognosis. Recovered with chlorpromazine therapy after failing to respond to deep insulin therapy.

Case No. 8

A single 17-year-old girl admitted on certificate February, 1956. There was no family history. She was the only child of mother's first marriage; her father died when she was 14 months. Mother married again and they were a very happy family. Patient was an active girl who took great pride in her appearance, did well at school, had a number of friends, was essentially reserved. For several months before admission she complained of being tired and out of sorts all the time. She found concentration difficult in her job as a typist. She tried changing it but it was to no avail.

On admission she was in a state of catatonia—mute, inaccessible, preoccupied, suspicious, frightened, resistive to feeding and medication and incontinent of urine. She was started on E.C.T. and in the next month made little progress. She then made an attempt at suicide by cutting her wrists. Chlorpromazine 100 mg. t.d.s. was started and E.C.T. continued for a further six weeks. She had 20 E.C.T.s in all. She remained flat, withdrawn, unresponsive with marked poverty of ideation. Some thought blockage was present and she was very apprehensive. The prognosis looked bad and the question of resorting to deep insulin therapy was discussed. Chlorpromazine was increased to 200 mg. t.d.s. and thyroid gr. 1 t.d.s. was added. She developed marked Parkinsonian symptoms and Artane 5 mg. t.d.s. was added. Her response to this increased and continued medication was astonishing. She became bright, cheerful, spontaneous with an affect of good quality, and could give a good account of herself and her illness. She was discharged in August, 1956 on a maintenance dose of chlorpromazine 50 mg. t.d.s. and thyroid gr. 1 t.d.s. She has been seen regularly as an out-patient since. After six months the dose was reduced to 25 mg. t.d.s. and the thyroid to gr. ½ t.d.s. After a year it was discontinued. She has remained well since and recovered completely from her illness. Has not relapsed though no longer on maintenance dose.

Summary. A catatonic schizophrenic with poor prognosis who failed to respond to E.C.T. and 300 mg. daily of chlorpromazine, but did respond to 600 mg. daily.

Case No. 9

A single woman admitted as a voluntary patient in 1954, then aged 28. Family history normal. Her mother and father separated when she was aged nine. Patient attached to father. Relations with mother always rather cold. Normal school and employment record but she was always rather shy, introverted, imaginative and unsociable. Onset of schizophrenic illness four years previously. Gradually and insidiously became worse until admitted.

On admission presented symptoms of a typical process schizophrenia. Manneristic and affect flat and incongruous. Extremely deluded and hallucinated. Delusions of influence governed by "Eastern witchcraft", being drugged and poisoned; lost identity—two persons; believed she had been murdered and cut up and that she had eaten human flesh, etc.

Placed on deep insulin. Treatment had to be terminated after 20 comas because of serious risk of irreversible coma—very poor veins. Her condition deteriorated and she became suicidal. Wanted to leave, had to be certified. Given 8 E.C.T.s and then placed on chlorpromazine 100 mg. t.d.s. Some improvement but developed jaundice. Chlorpromazine terminated, placed on reserpine 3 mg. t.d.s. Made satisfactory progress and three months later sent home on trial but continuing to take reserpine. A month later she became depressed with serious suicidal inclinations and she was taken off reserpine. Condition gradually relapsed and three months later, in April, 1956, she was re-admitted actively schizophrenic. Chlorpromazine was reinstituted (100 mg. t.d.s.). No jaundice occurred. The dose was raised to 200 mg. t.d.s. Her condition improved but she remained hallucinated. Three separate courses of E.C.T. (16 treatments each course) were given while she was on this dose of chlorpromazine but no further improvement ensued and hallucinations persisted. Dosage of chlorpromazine was now raised progressively to 300, 400 and finally 500 mg. t.d.s. On these higher doses she developed Parkinsonism, lethargy and gain of weight. Artane 5 mg. t.d.s. and thyroid gr. 1 t.d.s. were prescribed. It was only when she received 1,500 mg. of chlorpromazine per day that her hallucinations showed any signs of diminishing. She remained on this dosage for four months during which her hallucinations disappeared completely. She was sent home on 21 August, 1957 on a maintenance dose of 200 mg. t.d.s., having reached the stage of "Social Recovery".

Summary: Typical process schizophrenia (indeterminate type). Deep insulin had to be prematurely terminated. Jaundice on chlorpromazine, suicidal inclinations on reserpine. Second course of chlorpromazine, hallucinations only disappeared when dose had been raised to 1,500 mg. per day.

Case No. 10

Admitted aged 26 years in February, 1956. Only child of highly intelligent parents of independent means. Happy comfortable home. At the age of 7 had whooping cough, pneumonia, appendicitis and tonsillitis within ten months. Thereafter physically never very robust. Rather small stature. Average pupil but reports said she lacked confidence. Three years course of commercial art and interior decoration. Then worked as an advertising agent. No serious psychiatric disability before present illness but always shy, withdrawn, unassertive and rather dependent on parents.

Onset of illness when aged 22, January, 1952. Became dull, apathetic and spoke in monosyllables. Condition improved but did not recover and nine months later she developed overt schizophrenia. Admitted mental hospital near her home. Given full course of deep insulin, 32 comas, and also E.C.T. Good response: sent home very much improved July, 1953. Never entirely well and had three short acute exacerbations (dealt with adequately at home) before a complete relapse in November, 1954. Sent to private mental hospital. Poor prognosis given. Treatment there was confined to E.C.T. Numerous treatments given (about 100 in all). Condition always responded to E.C.T., only to relapse as soon as it was stopped. November, 1955 de-certified and sent home. Patient never really well and relapses frequent. Patient also developed transient attacks of unconsciousness and incontinence, symptomatically typical of petit mal but EEG normal. (First noticed December, 1955.) Patient re-admitted to that hospital January, 1956. Bad prognosis reiterated. Practitioner told by the hospital that chlorpromazine was unlikely to prove beneficial. He had heard of our results. Patient admitted here certified following an acute exacerbation.

On admission: noisy, restless, manneristic, grimacing, shallow and incongruous affect. Thought blocking. Childish in appearance and behaviour. Introverted, withdrawn, self-preoccupied, uncommunicative. Typical chronic schizophrenia. Commenced chlorpromazine April, 1956. On 100 mg. t.d.s. patient remained emotionally very flat, simple and monotonous. Dose raised to 200 mg. t.d.s. Had several petit mals—Epanutin added. Had a bout of depression followed a week later by a bout of excitement when she threw the cutlery around. Chlorpromazine reduced to 100 mg. t.d.s. At menses developed attacks like catatonia. Thyroid gr. 1 t.d.s. started in July, 1956. Patient's condition steadily improved and she became more vivacious, spontaneous, cheerful and sociable. Stated by parents to be better than she had been for years. Unfortunately petit mals (and one grand mal) continued. Discharged home August, 1956 "Much Improved". Maintenance dose of 100 mg. t.d.s. Has remained home since then and her condition has shown further improvement. Mother states she is now her usual self except for drowsiness due to chlorpromazine. Maintenance dose has now been reduced to 50 mg. t.d.s. She may be fit for employment again before long. All epileptic fits have ceased.

Summary: Recent schizophrenia 4 years' duration. "Much improved" by a course of deep insulin but condition relapsed. Thereafter repeated relapses following courses of E.C.T. Condition seemed hopeless, prognosis thought to be very poor. Transferred here: given chlorpromazine. Responded well. Has been home for one year without any relapses. Epileptic fits following E.C.T. and chlorpromazine, cleared up on smaller doses (i.e. maintenance doses).

IV.—The Effect of Chlorpromazine in Recent Cases

It is probable that the vast majority of schizophrenic cases who used to "recover" prior to the introduction of modern treatments (E.C.T., insulin, etc.) were atypical schizophrenics and it is equally probable that the outstanding results obtained from modern treatments in cases of under six months' duration are due to the inclusion of cases of this type. We have, therefore, endeavoured to differentiate these cases although it must be understood that the symptomatological picture they present definitely qualifies them for the group of schizophrenic illnesses.

Material

The beneficial effects of E.C.T. and deep insulin therapy on schizophrenic patients are in inverse proportion to the duration of illness up to a period of five years, and when of longer duration the results are so poor that deep insulin therapy is not warranted and E.C.T. of little use. Thus for reasons of therapeutic comparison with E.C.T. and deep insulin therapy we designated our "recent cases" as those who had been ill for less than five years. The cases were all females and were divided into two groups, Typical Schizophrenia and Atypical Schizophrenia (Schizophreniform Reactions).

Typical schizophrenics had ages ranging from 15 to 40 at the time chlorpromazine treatment was commenced and Atypical cases from 20 to 50. These recent schizophrenics were treated in an open admission ward containing also neurotic cases and other recent psychotics of good prognosis. It was the ward with the best environment and the best occupational-recreational-social facilities available in the hospital. The ward conditions were exactly the same as those prevailing when schizophrenic cases of these categories had been treated in our insulin coma clinic.

Prognosis

The prognostic factors in these cases are indicated in Table V, 16–21. The individual prognosis prevailing in Typical schizophrenia varied from fair to bad. The prognostic outlook was probably average for any similar group of recent schizophrenic admissions. The fact that prognosis is inversely proportionate to duration in hospital indicates for itself the comparatively bad outlook for the cases who had been in hospital over 3 years.

The prognosis for the Atypical (schizophreniform) group could be considered to be good in all cases, which is in keeping with the whole conception of this type of schizophrenia.

Method

By the time we started treating recent cases with chlorpromazine we had behind us the early experience with chronic patients and had devised the systematic method of treatment already enunciated. This was applied in broad outline to recent cases. We have, as already stated, always realized that each case is an individual problem and consequently have, where necessary, deviated in some respects from the usual procedure. For instance in these recent cases we often raised the dose more rapidly by shortening the "plateau" levels (see Diagram 1). Doses were perforce varied so that on the one hand an occasional case did not have her dose raised as high as 300 mg. per diem. In the recent cases the duration of treatment was shorter than that required for the more chronic cases.

Maintenance doses were given to nearly every case when they left hospital but in many of them and particularly all the Atypical group it was possible to withdraw all chlorpromazine medication and despite this they did not relapse. It was noticeable that the longer the duration of illness and the worse the prognosis, the greater was the need for continuing maintenance doses.

Results

The results obtained from chlorpromazine therapy were so good that we decided to close the insulin clinic and only to reopen it for the cases who had failed to react satisfactorily to chlorpromazine, bearing in mind the prognostic picture at the time chlorpromazine treatment was commenced. We have not so far had occasion to reopen the insulin clinic because we have not yet (considering prognosis) had any failures with chlorpromazine in recent cases.

Our group results are presented in Table V, 22 and 23, and our individual results by Case Nos. 6 to 10.

It is interesting that several cases in this series had previously been treated by deep insulin therapy, sometimes successfully in the first and second instances, only to be chronically hospitalized thereafter. Many of these cases responded well to chlorpromazine and have so far remained out of hospital since treatment. The effects of chlorpromazine on 57 cases who had failed to respond to deep insulin coma are shown in Table V, 24.

The question of maintenance doses is again relevant to the various grades. In order to indicate the number of cases still receiving maintenance doses these figures are placed in brackets prefaced by a capital C. It seems probable that most patients treated early in their illness and with good prognosis will remain well without maintenance doses. In others it may become possible to abandon maintenance doses after several months or years. Only time will tell whether this is warranted. However, by the very nature and characteristics of the illness further attacks sooner or later may occur in any case and will then call for a further course of chlorpromazine.

It seems to us that the "Recovered" or "Social Recovery" cases who are weaned completely from the drug resemble cases of influenza who remain well permanently or for indefinite periods (often of many years) before another attack occurs and that they bear a corresponding relationship to the ultimate outcome of the disease. They may with equal validity be said to have "recovered" from the immediate attack for which they were treated.

The cases who remain in these grades only under maintenance treatment are akin to cases of diabetes who, thanks to insulin, may have periods of months and years between attacks, which, when they do arrive, almost invariably respond to increased dosage of insulin. While such cases must continue with insulin, they have between attacks, clinically recovered or almost recovered from their symptoms. Our controlled "Recoveries" or "Improvements" may in general be considered equivalent to diabetics whose continuous recovery or improvement is dependent on maintenance doses of insulin.

The only way of portraying the true prognostic picture would be to record the various traits for each individual patient and space forbids us to do so here. We can only submit our findings that with few exceptions the therapeutic results obtained varied in approximately direct proportion to the prognostic indications for the patient prior to the commencement of treatment. (This is instanced to some extent in the case histories at the end of the article.)

A few mental defectives with supervening schizophrenia were also in this series and most of them responded satisfactorily to chlorpromazine, but like similar cases in our group of chronic patients they were excessively susceptible to chlorpromazine both therapeutically and as regards side effects and they all required comparatively small doses of the drug.

Relapses occurred in 25 per cent. of cases of typical schizophrenia but they responded very well to a further course of chlorpromazine which restored each patient to the condition prevailing before the relapse occurred. Relapses were with few exceptions directly associated with the prognostic picture prevailing in any patient. The shorter the duration of illness and the better the prognosis prior to treatment the less was the liability to relapse. Of great consequence were the environmental circumstances to which a patient proceeded on discharge from hospital. The better the attitude of relatives and friends, the more congenial the home circumstances and the more acceptable the employment to which a patient proceeded the more likely was the patient to remain well.

We are well aware that the final chapter regarding the effects of chlorpromazine on these patients will only be written when they have been followed up over many years.

There have been no relapses up to date in the Atypical schizophrenic group.

The usual side effects occurred amongst this series and their frequency is recorded in Table IV, 15. They were treated in a similar manner to that already described for chronic patients.

Finally, we have surveyed the cases of a similar type treated in the deep insulin clinic over the five years previous to chlorpromazine therapy and present the results in Table V, 25, for purposes of comparison with the figures presented in Table V, 22. This comparison, within its limitations, reveals the superior results obtained from chlorpromazine, especially in cases of over three years' duration.

Our total results and figures from chlorpromazine therapy for recent and chronic patients make it clear that this chemotherapy presents an advance on deep insulin therapy. This contention is based on the fact that chlorpromazine has produced improvement and recovery in a high proportion of our schizophrenic cases of many years' duration, previously deemed irretrievable by deep insulin therapy or any known therapy; in our group of recent cases it has produced results that can be considered superior to deep insulin therapy from comparison with the results obtained in our deep insulin clinic during the previous five years: it has effected remissions in cases having previously received two or even three courses of deep insulin with ultimate failure; and finally relapses up to date have always responded to a further course of chlorpromazine. Furthermore, chlorpromazine therapy is less dangerous and less unpleasant to the patients and causes less anxiety and trouble to the medical and nursing staff. The advantage of being able to use maintenance doses of chlorpromazine temporarily or permanently is also greatly in its favour.

Apart from the above advantages chlorpromazine does not involve the perpetual danger of an irreversible coma which is the *bête noire* of deep insulin therapy. No fatalities with chlorpromazine occurred, but two resulted from irreversible insulin coma, in the course of treatment in our deep insulin clinic between 1951 and 1954 (neither was a schizophrenic case and in the present series).

It is also interesting to compare the results of chlorpromazine with those obtained from leucotomy. Table V, 26, represents the results in all female schizophrenic patients ever treated by leucotomy in this hospital. Table V, 27, shows the results of chlorpromazine therapy on those patients who had been previously leucotomized. It speaks for itself regarding the additional benefits bestowed by chlorpromazine.

TABLE VI

Results Obtained by Other Writers, Referred to in the Discussion Showing Some Comparative Figures of Results Between Chlorpromazine and Reserpine Therapy of Schizophrenics

28.—*Goldman (1957)*

	Reserpine				Chlorpromazine			
Hospitalization in years	0–2	2–5	5–10	Over 10	0–2	2–5	5–10	Over 10
Complete recovery	1	2	—		59	9	5	1
Good social remission	9	4	3	9	104	60	32	38
Improvement	38	21	21	60	110	58	62	131
No improvement	8	6	8	50	18	4	7	58
Total	56	33	32	119	291	131	106	228

29.—*Freyhan et al.* (*1956*)

	Chlorpromazine Per cent.	Reserpine Per cent.
Very good	26·2	7·4
Good	51·9	44·1
Unsatisfactory	21·9	48·5
Worse	0·0	0·0
Total number of cases	324	68

Showing Results Obtained by Other Writers from Chlorpromazine Therapy of Schizophrenic Patients

30.—*Goldman* (*1955*)

	Under 2 Months' Treatment				Over 2 Months' Treatment			
Hospitalization in years	0–5	5–10	Over 10	Total	0–5	5–10	Over 10	Total
Complete recovery	1	–	–	1	38 (31·6)	–	–	38 (19·0)
Good social remission	9	–	1	10	28 (23·3)	1	3	32 (16·0)
Improvement less than the above grades	30	6	12	48	46 (36·6)	31	17	94 (47)
No change	16	12	29	57	8 (6·6)	7	22	37 (18·5)
Total	56	18	42	116	120	39	42	201

(Percentages in brackets)

31.—*Pollack* (*1955*)—*275 Cases of Schizophrenia*

Duration of illness in years	0–1	1–5	Over 5
Psychosis improvement—recovered to much improved	71%	49%	29%

32.—*Kinross-Wright* (*1955*)

	No. of Cases
Remission	40 (37%)
Much improved	42 (38·8%)
Improved	18 (16·6%)
Unchanged	8 (7·4%)
Total	108

33.—*Lomas* (*1955*)

136 Schizophrenics, 44 of Whom had been in Hospital over Two Years

	No. of Cases
Recovered	4 (3%)
Much improved	17 (12%)
Moderately improved	39 (29%)
Slightly improved	39 (29%)
Not improved	37 (27%)
Total	136

34.—*Labhardt* (*1954*)

Duration of illness in years	0 to 1	1 to 5	More than 5
Social recovery and complete remission	39 (73%)	19 (41%)	19 (18%)
Improved	11 (21%)	22 (48%)	70 (66%)
Unimproved	3 (6%)	5 (11%)	17 (16%)
Total number of cases	53	46	106

35.—*Some Results from Convulsive Therapy of Schizophrenics*

	Meduna (1937)			*Low et al. (1938)*		
	No. of Cases	No. of Re-missions	Per cent.	No. of Cases	No. of Re-missions	Per cent.
Under 1 year	43	39	90	15	5	38·4
1 to 2 years	18	9	50	10	1	10
2 to 5 years	23	6	35	18	2	10
Over 5 years	26	0	0			
Total	110			43		

36.—*U.S.A. 1,465 Cases of Schizophrenia*

Meduna and Friedman (1939)

Duration of Illness	No. of Cases	Remissions	Improvements
Under 6 months	201	128 (60·5)	42 (20)
6 to 12 months	210	74 (38·8)	47 (23·1)
Over 1 year	1,054	88 (8·3)	378 (37·7)

(Percentages in brackets)

Results from Deep Insulin Therapy of Schizophrenia

37.—*Dussik and Sakel (1936) (104 Cases)*

Duration of Illness	No. of Cases	Percentage Full Remission	Percentage Fit for Work
Under 6 months	58	70·7	86·2
Over 6 months	46	19·6	45·7

38.—*Muller (1937) (495 Cases)*

	Percentages		
Duration	Full or Social Remission	Improved	No Change
Under 6 months	59·1	82·9	17·1
Up to 1 year	57·2	78·4	21·6
1 to 2 years	27·3	61·4	38·6
Over 2 years	11·3	43·5	56·5
Total	40·4	66·7	33·3

39.—*Pollock (1939) (1,140 Cases)*

	Percentages				
	Recovered	Much Improved	Improved	No Change	Dead
Control	11·2	7·4	7·5	65·8	4·6
Insulin	12·9	27·1	25·3	33·4	1·3
Convulsive therapy	1·6	9·9	24·3	63·5	0·5

Showing Results from Leucotomy

40.—*Partridge (1955): 77 Cases of Typical Schizophrenia*

		Per cent.
Recovered	3	3·9
Social recovery	3	3·9
Improved at home	16	20·7
Improved in conduct	30	38·5
Not improved	15	19·3
Worse	3	3·9
Died at operation	3	3·9
Died from other causes	1	1·3
Total	74	

41.—*Stengel (1950)*

(*a*) Results of operation:

		Per cent.
Discharged	65	(32·5)
In hospital	115	(57·5)
Dead	20	(10·0)
Total	200	

(*b*) *Fate of the 65 Discharged Schizophrenics*:

Duration of Last Attack Before Operation	Full Remission	Much Improved	Improved	Conduct Improved	Un-changed	Total
Less than 2 years	18	6	4	–	–	28
2 to 5 years ..	3	7	4	2	1	17
5 to 10 years ..	–	2	3	6	–	11
10 to 20 years ..	1	–	4	2	–	7
Over 20 years ..	–	–	–	–	2	–
	22	15	15	10	3	

V.—DISCUSSION

THE EFFECTS OF GROUP TRAINING ALONE

The effects of four years' group training which we have described above (on chronic schizophrenics) prove beyond doubt the important part that this method plays in ameliorating the patients' behaviour and the general ward conditions. The paucity of literature describing results obtained by others from such measures is astonishing and we have not been able to discover any article comparable to the present one, although one by Bennett and Robertson (1955) deals with results in a few patients.

The value of occupational therapy of one sort or another has been appreciated since the days of Sir William Ellis (first Medical Superintendent of Wakefield, and afterwards of Hanwell (now St. Bernard's Hospital), 1830), but during the subsequent 100 years its application to chronic schizophrenics was a perpetual problem owing to their unruly behaviour, and the "snake pit" conditions prevailing in the wards (even after the abolition of mechanical restraint by Conolly and others). Consequently many patients deteriorated and demented behind locked doors and walled airing courts.

Meyerson (1939) appreciating this distressing situation introduced what he called the "Total Push" method to try and overcome it and T. P. Rees at

Warlingham Park Hospital evolved a programme of habit training devised for similar purposes. This was described by Symons (1951) and we have based our group training methods mainly on the scheme he propounds.

The use of similar methods has formed the foundation upon which several mental hospitals in this country have managed to abolish locks and keys in all their chronic wards and to become completely "Open Hospitals". This occurred before chlorpromazine had been heard of, and, even despite the introduction of chlorpromazine therapy, group training retains a position of paramount importance in the treatment of chronic schizophrenics.

Pollack (1955) remarks that of 85 patients who had required restraint or seclusion for many years, 42 had been free from these measures for a month as the result of chlorpromazine therapy. It would seem apparent that he does not realize that group training methods in themselves can almost completely abolish the need for restraint and seclusion. One wonders how many psychiatrists describing results obtained from chlorpromazine on chronic schizophrenics have previously tried the effects of group training on such patients.

IS CHLORPROMAZINE THERAPEUTICALLY MORE EFFICIENT THAN RESERPINE?

Our own comparison between chlorpromazine and reserpine was performed with small doses of these drugs over a period of only six months. For this reason we do not claim that our results in themselves can be considered very impressive.

Some psychiatrists have made noteworthy claims for reserpine (Moore, 1957; McGrath, 1956) in the treatment of schizophrenia. Others who have endeavoured to compare the therapeutic potentialities of these two tranquillizers have all favoured chlorpromazine, as exemplified by the figures of Freyhan *et al.* (1956), Feldman (1957) and Kurland (1955) (see Table VI, 28 and 29). Goldman (1957) confirms this opinion and so do Leiberman and Vaughan (1957) who state that chlorpromazine is more effective, acts more quickly, and has less unpleasant side effects than reserpine. The side effects of chlorpromazine are more numerous but less severe than those of reserpine and there are three other respects in which the use of the latter drug seems dangerous:

1. After prolonged use reserpine may produce depression with pronounced suicidal tendencies—suicidal deaths have been reported. Because of this a *British Medical Journal* (1956) leading article advises that reserpine should not be used for more than a few months at a time. We have found that treatment lasting many months is often necessary in chronic schizophrenics (confirmed by other writers, see below) which is therefore a contraindication to the use of reserpine.

2. The use of E.C.T. with patients receiving reserpine is contraindicated (Shepherd, 1956). It is reported to be dangerous and to have resulted in fatalities (Foster and Gayle, 1955; Epstein, 1956; Wortis, 1957).

3. The very severe Parkinsonism which we found to develop in most cases treated with reserpine and the fact that so many patients on that drug experienced such very unpleasant general malaise.

Some writers think that the two drugs may act synergistically (Schmidt, 1957), but Hollister (1956) found that chlorpromazine alone was more effective than a combination of the two drugs.

Feldman (1957) reports that side effects are more frequent and severe from a combination of chlorpromazine and reserpine than from chlorpromazine alone. This applies in particular to Parkinsonian symptoms.

It may be said in the light of all the evidence available that chlorpromazine is therapeutically more efficient than reserpine in the treatment of schizophrenia and indeed there is little if any call for the use of the latter drug alone for such a purpose, although there may be a few cases in which it may advantageously be combined with chlorpromazine.

The Clinical Response of Schizophrenics to Chlorpromazine

As a preliminary to answering this query and the following ones it is well to bear in mind that schizophrenia pursues a sporadic and protean course. Bleuler's (1936) ideas on the subject are described thus:

> "This disease may come to a standstill at every stage and many of the symptoms may clear up very much or altogether: but if it progresses, it leads to a dementia of a definite character."

and again

> "The disease at times runs a chronic course, at times in shifts; it may become stationary at any stage or may regress a certain distance, but probably does not permit a complete *restitutio ad integram*."

Kraepelin was insistent that the diagnosis, prognosis and therapeutic outcome of any mental illness was only thoroughly gauged by following it from its incidence throughout the life of the patient.

These facts combined with the difficulties already mentioned in the introduction to this article make clear the limitations of reflecting the value of any therapy of schizophrenia by results expressed in percentage figures alone. Nevertheless such figures are of value against the background of a reliable text and a survey of results—good and bad—from all reliable writers still offers one of the few methods of quick comparison between the various forms of treatments.

Our figures portray the total benefits chlorpromazine has bestowed on both recent and chronic cases of this illness while our case histories illustrate the situation from the point of view of individual cases.

It is not easy to find representative figures for comparison with our own but those of Goldman (1955), Kinross-Wright (1955), Pollack (1955), Lomas (1955) and Labhardt (1954) are worthy of note and are presented in Table VI, 30–34. Although showing variation in the results obtained, on the whole they endorse our own in indicating the outstanding therapeutic effects of chlorpromazine on schizophrenia.

Labhardt (1954) points out that results have been less favourable in male patients than female patients, an impression that we ourselves have gained from the reports of colleagues. Allowance must be made for the fact that all of our patients were female, and that our figures would probably not have been so good with combined female and male material. Hyvert *et al.* (1955) also commented on the comparatively unfavourable results in male patients and advise the use of oestrogens with chlorpromazine.

Schizophrenia is by its nature a relapsing disease and one of the great therapeutic problems has always been that of dealing with successive relapses. Our relapse rate is quite high but as we have said all relapses have responded to further treatment. Pollack (1956) reports that maintenance doses of chlorpromazine have reduced his relapse rates from 30 per cent. to 7 per cent.

With reference to the manner in which the effects of chlorpromazine are manifested clinically, various contentions have been expressed. Pollack (1955) states that "chlorpromazine acts by facilitating communication and permitting an objective view point of the stresses and difficulties which are upsetting the individual". Sainz (1955) says "chlorpromazine in schizophrenia induces enhanced logical thinking, increases insight, improves judgment and reduces anxiety". Hock (1956) maintains that its effects are similar to certain of the more desirable results from leucotomy, on the emotional and autonomic functions, thus relieving the intellectual faculties and facilitating a re-integration of personality. Kinross-Wright (1955) believes that "its most noticeable effect is a facilitation of communication together with remarkable objectivity towards significant ideas and feelings".

As a matter of interest, psychological tests done by Shatin *et al.* (1956) showed that, despite mask-like faces and other symptoms produced by large doses of chlorpromazine, patients were still capable of fine motor co-ordination and of higher mental functioning.

We are in agreement that all of these explanations can be attributed to chlorpromazine, but in our estimation the whole nature of schizophrenic illness is so complex that the action of chlorpromazine may most aptly be summarized by saying that "it, metaphorically speaking, releases the grip of the psychosis in degrees varying from one patient to another".

It is obvious from the above quotations, and our findings, that chlorpromazine has a profound effect upon the fundamental schizophrenic dysfunctions. Our own opinion, already expressed, is that for every patient there is an optimum dose which when applied for an adequate time will produce the maximum result to be obtained in that particular patient. Despite the results obtained up to date by ourselves and others, we do not claim that chlorpromazine has by any means finally solved the problem of treatment for schizophrenia, or that its use will prevent the occurrence of chronic schizophrenia. However, it does seem certain that thanks to its effects and those of group training chronic schizophrenics will hardly ever reach the state of profound deterioration and dementia inevitable in so many of them in the past.

The Side Effects Occurring from the Use of this Drug

We have already emphasized the necessity of coping with the side effects of chlorpromazine in obtaining the best therapeutic results. Table IV, 15, shows the frequency with which the various individual effects occurred in both our recent and chronic cases, but the total number of cases dealt with is in itself small and not necessarily representative of the whole field of psychiatry. Side effects have occupied the attention of many writers who have enumerated them and described them in detail (Kinross-Wright, 1957; Pollack, 1955; Boardman, Lomas and Markowe, 1956) but they have differed considerably in their opinions regarding the frequency and mode of origin of the various individual symptoms. It is of such consequence for psychiatrists using chlorpromazine to have a thorough knowledge of its side effects that we now present a systematic scheme which we have derived from our own experience synthesized with descriptions by other writers. The terms "complications", "toxic effects" and "side effects" have been used, sometimes two or even three of them in the same article. We believe that this is muddling and prefer to group all the symptoms under the general heading "Side Effects" no matter what their origins may be.

The side effects of chlorpromazine may conveniently be subdivided into reactions due to: (*a*) chlorpromazine's "toxic-sensitivity" effects on any individual patient and (*b*) its pharmacological effects on the nervous system. (*c*) Its effects on the endocrine system.

(a) *Toxic-sensitivity Sensations*

Pyrexia occurring in the second week of treatment, usually about the 10th day and lasting about a week.

Jaundice (·1 to 4 per cent.) of the intrahepatic obstructive type with blocking of the canaliculi but a normal parenchyma.

Blood Changes: Eosinophilia, leucopenia and slightly raised blood sedimentation rate (all frequent). Agranulocytosis (rare).

Skin Reactions: (8 to 20 per cent.). Usually a general erythematous rash, a morbilliform-macula rash or pruritus. Oedema may occur in combination with these rashes or alone. Intense itching is frequent. Photosensitivity is common.

Toxic Confusional States (about 2 per cent.) may occur on any dose but occurs most frequently with high doses.

The pyrexia is often a prelude to the toxic-sensitivity reactions which follow it at an interval of usually not longer than two or three weeks. Lomas *et al.* (1955) found that "toxic reactions of any type were very rare after the end of the 5th week". All these reactions may occur on doses as small as 300 mg. per day or less. They nearly always clear up within a week or two of withdrawal of the drug but jaundice may sometimes persist for many weeks thereafter.

Occasional fatalities from jaundice and agranulocytosis have been reported.

(b) *Reactions Due to Effects on the Nervous System*

(i) *Central.* Parkinsonian symptoms of varying severity including mask-like expression, rigidity, tremors, salivation and oculogyric crises. Torsion spasms. Drowsiness and fatigue of the subcortical type.

(ii) *Reactions from the Autonomic-Endocrine System. Head:* Miosis; blurring of vision; nasal congestion; dryness of the mouth, difficulty in swallowing.

Cardio-vascular system: Postural hypotension with feelings of dizziness and fainting. Tachycardia.

Respiratory system: Occasional dyspnoea.

Alimentary system: Increased appetite (leading to adiposity), nausea, dyspepsia, constipation.

Urinary system: Polyuria and frequency. Incontinence. Cases of retention have been described (Pachter, 1957).

(c) *Endocrine Reactions*

Amenorrhoea, lactation, glycosuria.

The group of centrally originating symptoms tend to remain constant in cases receiving optimum doses although they may diminish in intensity without the use of any counter-measure.

The "autonomic" symptoms are less troublesome and unpleasant and tend to clear up spontaneously as a tolerance for the drug develops during treatment, or to respond to symptomatic treatment.

Endocrine reactions tend to persist throughout the course of chlorpromazine (see Section III).

Chlorpromazine, especially in large doses, may give rise to epileptic fits. Schlichter *et al.* (1956) found that 11 out of 21 patients on 4,000 mg. of chlorpromazine per day developed fits. Fits may occur at any period of the treatment.

Wardell (1957) reported that two cases, one on 300 mg. of chlorpromazine per day and the other on 600 mg. per day, died from extensive bronchopneumonia without the usual pulmonary signs and symptoms. This finding that chlorpromazine may mask the symptoms of somatic disease is worthy of note.

We may summarize this sub-section with the contention that the side effects of chlorpromazine, although numerous, are very seldom dangerous and that with a thorough knowledge of their qualities and appropriate medication to combat them they need seldom prove sufficiently troublesome to preclude the use of optimum doses of chlorpromazine.

Chlorpromazine: Optimum Dose and Mode of Administration

We are still in the early days of experience with chlorpromazine and no standard method of treatment has yet evolved. Faced with this situation we devised a method based on our own experience. We have found this method efficacious but in many ways it differs from other methods described up to date. The conception of determining the "optimum" dose for each patient on the "incline plateau" basis and then continuing it for periods extending from weeks to years is a novel one. The importance of combining Artane, thyroid and E.C.T. with chlorpromazine in the manner we have advocated sometimes over a period of many months has also not been previously described.

We have not used injections of chlorpromazine and our method may not produce such rapid results as some others. We believe that steady methodical treatment is essential and that undue haste is to be avoided.

However, we do not believe that our method is the final word on therapy and its merits or faults can only ultimately be assessed in the light of further experience and when weighed against methods described by others and followed up over many years.

In the meantime the fact that our results are more favourable than those of other writers (see Tables IV, V and VI) may well be due to the method we have adopted and the prolonged treatment given in chronic cases.

Opinions differ greatly from one psychiatrist to another regarding doses to be used for schizophrenics and they have varied from 75 to 1,500 mg. per day (Alsen and Johansson, 1956), to from 800 to 3,600 mg. per day (Kinross-Wright, 1955). The latter author favours intense treatment over short periods rather than small doses over long periods but whereas his intense course (1,000 to 3,000 mg. per day) originally lasted only two weeks (1955) he is now prepared to use the same doses over prolonged periods (1957). Ayd (1956) gave doses of from 700 to 2,500 mg. daily and eventually considered that the large doses were no more effective than 200 to 300 mg. per day. Delay *et al.* (1956) do not feel that doses of more than 300 mg. per day are of any additional use. Pollack (1955) found that higher doses do not seem to be more effective than 500 to 600 mg. daily and Leiberman (1956) states that there was no advantage in giving over 800 mg. per day.

The duration of treatment advocated also varies from one writer to the next, but some writers stress the importance of treatment being prolonged over several months. Labhardt (1954), Goldman (1955) and some Continental workers aim at producing extra-pyramidal signs to obtain the best therapeutic results (Hewat *et al.*, 1955). Pachter (1957) found that 50 per cent. of cases could not receive the dose producing maximum improvement because of drowsiness. Pollack (1955) added dextroamphetamine, 6 mg. thrice per day to counteract drowsiness (see also Winkelman, 1957). We ourselves have found that dextroamphetamine is prone to reactivate the psychosis in schizophrenic patients. This is of interest since chlorpromazine does not stimulate the cerebral cortex and it appears that in schizophrenic patients such stimulation is contra-indicated.

Several writers have observed that the greater the dose of chlorpromazine the more frequent and intense are the side effects. Goldman (1955) maintains that electro-shock therapy and insulin therapy act synergistically with chlorpromazine and Kinross-Wright (1957) says that most workers are agreed that E.C.T. can safely be combined with chlorpromazine.

Nearly all writers maintain that chlorpromazine should be given primarily by injection and after the preliminary reaction orally. Although we ourselves have not used injections we believe that in certain cases they are useful and warranted.

Chlorpromazine treatment must still be considered empiric and it is only when the true pathology of schizophrenia has been discovered and tests devised to measure the degree of its reversal by therapy that the most efficacious mode of administering this drug or any other will be determined. In the meantime we would emphasize that only by skilful methodical administration of chlorpromazine over prolonged periods will its best results be obtained and we tentatively present our own scheme for trial by those interested.

Is Chlorpromazine More Effective than E.C.T., Deep Insulin and Leucotomy in the Treatment of Schizophrenia and if so Have the Latter Treatments Become Obsolete for this Disease?

We are still in the early years of chlorpromazine therapy and judging from similar phases in the other therapies mentioned results published to date may be somewhat over-optimistic. Despite this there is ample scope (from the many reports available) for a comparison between the various treatments.

As an introduction to this subject it is well to remember that some schizophrenic cases did recover and obtain their discharge from mental hospitals as a result of the ordinary routine methods existing before convulsive therapy or deep insulin. As the outcome of a thorough survey of every published article dealing with the remission rates prior to convulsive therapies, a synthesis was made covering a total of 3,192 patients, and of these patients 40 per cent. were recovered or much improved and the rest deteriorated (Blair, 1940). A few writers dealt with the relationship between the remission rates obtained and the time the illness had persisted prior to admission (Hunt, Feldman and Fiero, 1938) and found that improvement effected was inversely proportional to duration of illness. Fuller (1935) in a ten-year follow-up of 947 discharged patients showed that 43·8 per cent were still in the community after ten years, 43·3 per cent. were by then in a mental hospital and 12·8 per cent. had died. The glum outlook to be inferred from all the available facts and figures is obvious.

The original figures for convulsive therapy were astonishing, varying from 90 per cent. (Meduna, 1937) to 38·4 per cent. (Low *et al.*, 1938) remissions in psychoses of under one year's duration. In the course of time figures varying from optimistic (Meduna and Friedman, 1939) to pessimistic (Pollock, 1939; Ross and Marlzberg, 1939) were forthcoming. (See Table VI). Cook (1944) and Kalinowsky and Hoch (1952) cover the whole field very thoroughly. One all-important feature was commonly agreed upon by all writers, namely the rapidly diminishing effect of convulsive therapies with the increase in duration of illness. The final verdict acceptable to most psychiatrists would probably be that whereas convulsive therapy may produce remissions or much improvement in many cases of less than one year's duration and in some of from one to two years' duration, such results are very rare with duration of over two years and virtually non-existent in cases of over five years' duration. It is, however, of great use in ameliorating the worst phases of chronic cases.

Our own results and those of other writers which we have quoted reveal the great superiority of chlorpromazine over E.C.T. in cases of over two years' duration and almost certainly also in most cases of less than that duration. However, E.C.T. is an important adjuvant to chlorpromazine in many cases.

After Sakel introduced deep insulin therapy in 1933 a spate of reports and figures was soon forthcoming. Dussik and Sakel (1936) reported 86 per cent. remissions amongst a group of patients ill for less than six months, 70 per cent. of them being "full remissions" and Muller (1935) obtained 70–80 per cent. remissions in cases of less than six months' duration, but Ross and Malzberg's figures from New York (1939) showed only 29·2 per cent. recoveries and 30·2 per cent. much improved cases. Many subsequent figures were less favourable, (e.g. Pollock, 1939), than those of Sakel and Muller but in one respect all authors have agreed, namely, that the percentage of beneficial effects obtained rapidly decreases with the duration of illness. Mayer-Gross, Slater and Roth (1954) summarize the final claims for insulin, thus:

> "If applied within the first year of illness it more than doubles the number of remissions that can be expected to occur spontaneously. Later on while the disease is still in its second year the number of remissions obtained by treatment though not so good is greater than spontaneous remissions. After the second, however, the effect of treatment becomes insignificant for a series of treated patients as compared with an untreated series."

Very few writers have endeavoured to compare results from chlorpromazine and deep insulin, but Boardman *et al.* (1956) as the result of a statistical comparison between equivalent groups of schizophrenic admissions suggest that chlorpromazine is the treatment of first choice in schizophrenia and only when it has proved ineffective should recourse be had to insulin.

Our total results on schizophrenics of all degrees of chronicity form the basic reasons for our firm contention that chlorpromazine therapy is therapeutically a distinct advance on deep insulin therapy. While perhaps not superior to insulin as far as percentages for illnesses of up to one year's duration are concerned, it is obviously much superior for illnesses of any longer duration. This is of major consequence since it reveals that chlorpromazine attacks the schizophrenic process more radically and potently than deep insulin. Moreover the figures for deep insulin carried with them an overall mortality rate from the treatment itself of from 1 per cent. to 2 per cent., whereas the percentage fatalities reported from the treatment of many thousands of cases by chlorpromazine are much less and certainly do not work out at a maximum of more than ·1 per cent. and probably much less than that.

Full leucotomy operations are by general agreement only resorted to when all other measures have proved ineffective. (It is questionable whether the modified leucotomies are of any use for typical chronic schizophrenia.) Many figures have been published regarding remission rates obtained in schizophrenia from leucotomy. Those of Partridge (1950), 7·8 per cent. remissions and Stengel's (1950) 11 per cent. remissions and our own figures for this hospital may be considered as representative (see Table VI, 40 and 41).

A comparison of those figures with our figures (Table IV, 11; Table V, 22) and those of others for chlorpromazine therapy (Table VI) indicates the superiority of the latter method, and this is substantiated by the fact that chlorpromazine produced a further considerable improvement in our cases who had been leucotomized several years previously (see Table V, 27). The high mortality rate, the frequent irreparable damage to personality and the liability to post-operative epilepsy, which are associated with leucotomy, clinch the argument. The above remarks apply to the full radical leucotomy but with rostral leucotomies and other modifications the same picture persists in a paler shade.

Sargant (quoted by McMurdoch, 1957) deplores the fact that patients who have been in mental hospitals for as long as ten years have not had measures such as leucotomy and feels that tranquillizers could hardly be expected to have a more rapid action than this operation. We believe that patients who fail to respond to chlorpromazine are hardly likely to do so to leucotomy except in rare instances.

We may summarize the prevailing situation thus. In the light of our results and all other evidence available to date it seems probable that there will in the future be very little need for E.C.T. and deep insulin therapy as the primary treatment of schizophrenia and that leucotomy operations are contra-indicated unless in exceptional circumstances. E.C.T. has a very definite place as an adjuvant to chlorpromazine and so may sub-coma doses of insulin (as reported by Ford and Jameson, 1955).

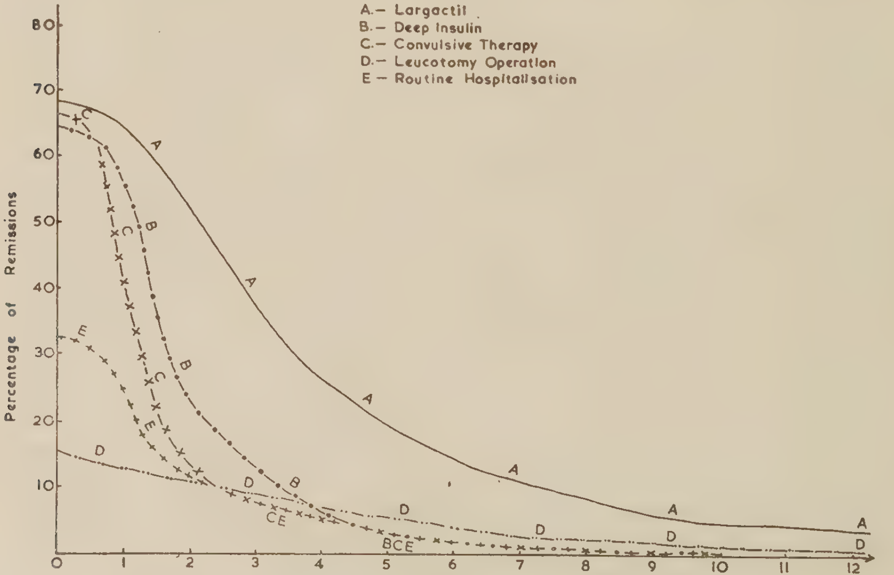


DIAGRAM 2.—Comparing the therapeutic effects of Largactil, deep insulin therapy, convulsive therapy, leucotomy operation, and routine hospital treatment without any of the above treatments.

In conclusion we present Diagram 2, representing within the very broad approximation a comparison of the immediate outcome of the various forms of therapy, in relationship to the duration of illness. The yardstick we have used for comparison is the percentage remission rates claimed. The word "remissions" has been used very loosely by different psychiatrists (see Blair, 1940). We here used the definition of Hunt, Feldman and Fiero (1938), namely "cases showing a disappearance of all active psychiatric manifestations and returning to a substantially normal life in the community with or without scarring of the personality and with or without insight", a definition with which Kalinowsky and Worthing (1943) concurred. The graphs are based on average figures (as far as that is possible).

References

Alsen, M., and Johanson, E., *Nordisk. Med.*, 1956, **55**, 377.
Ayd, F. J., Jnr., *Psych. Res. Report*, 1956, **14**, 64.
Batt, J. C., Kay, W. W., Reiss, M., and Sands, D. E., *J. Ment. Sci.*, 1957, **103**, 240.
Bennett, D. H., and Robertson, J. P. S., *ibid.*, 1955, **101**, 664.
Blair, Donald, *ibid.*, 1940, **88**, 378.
Bleuler, E., *Textbook of Psychiatry*, 1936. New York: MacMillan & Co.
Boardman, R. H., Lomas, J., and Markowe, M., *Lancet*, 1956, *ii*, 487.
Cook, L. C., in *Recent Progress in Psychiatry*, 1944. Special Edition. London: Churchill.
Delay, J., and Deniker, F., *Clin. exp. Psychopath.*, 1956, **17**, 19.
Idem and Ropert, R., *Presse Méd.*, 1956, **64**, 493.
Denber, H. C. B., *J. Amer. Med. Ass.*, 1955, **158**, 586.
Dussik, K. T., and Sakel, M., *Zeitschr. f. d. ges. Neurol. u. Psychiat.*, 1936, **155**, 351.
Epstein, J., *J. Amer. Med. Ass.*, 1956, **160**, 503.
Feldman, P. E., *Amer. J. Psychiat.*, 1957, **113**, 589.
Ford, H., and Hameson, G. K., *Dis. Nerv. Syst.*, 1955, **16**, 6.
Foster, M. W., and Gayle, R. F., *J. Amer. Med. Ass.*, 1955, **159**, 1520.
Freyhan, F. A., Turner, P., and Stenzler, R., *Delaware State Med. J.*, 1956, **28**, 180.
Fuller, R. G., *Psychiat. Quart.*, 1935, **9**, 95.
Goldman, D., *J. Amer. Med. Ass.*, 1955, **157**, 1274.
Idem, *Amer. J. Med. Sci.*, 1957, **233**, 137.
Gjessing, R., *J. Ment. Sci.*, 1938, **84**, 608.
Hewat, J. R., Leach, F. W., and Simpson, R. W., *Brit. Med. J.*, 1955, *ii*, 1119.
Hock, E. H., *J. Christ. Med. Ass. India*, 1956, **31**, 285.
Hollister, L. E., *California Med.*, 1956, **183**, 218.
Hunt, R. C., Feldman, H., and Fiero, R. P., *Psychiatric Quart.*, 1938, **12**, 414.
Hyvert, M., Fagard, H., and Huchon, J., *Ann. Méd.-Psychol.*, 1955, **113**, 643.
Kalinowsky, L. B., and Hoch, P., *Psychosurg.*, Shock Treatments, 1952.
Idem and Worthing, H. J., *Psychiat. Quart.*, 1943, **17**, 144.
Kasak, M., Schaefer, D. L., and White, W., *Marquette Med. J.*, 1955, **21**, 17.
Kinross-Wright, V., *Amer. J. Psychiat.*, 1955, **111**, 907.
Idem, *Dis. Nerv. Syst.*, 1955, **14**, 114.
Idem, *Psych. Res. Reports*, 1955, **1**, 53.
Idem, *Med. Clin. North Amer.*, 1957, **41**, 295.
Kurland, A. A., *J. Neur. Ment. Dis.*, 1955, **121**, 321.
Idem, *Amer. Med. Ass. Arch. Neurol. Psychiat.*, 1956, **75**, 510.
Labhardt, F., *Schweiz. Arch. Neurol. Psychiat.*, 1954, **73**, 309.
Langfeldt, E., *Acta Psychiat. et. Neurol.*, 1937, Suppl. 13.
Leiberman, D. M., *Brit. Med. J.*, 1956, *i*, 512.
Idem, and Vaughan, G. F., *J. Ment. Sci.*, 1957, **103**, 110.
Lomas, J., *Brit. Med. J.*, 1955, *i*, 879.
Idem, *ibid*, 1957, *ii*, 78.
Idem, Boardman, R. H., and Markowe, M., *Lancet*, 1955, *i*, 1144.
Low, A. A., *et al.*, *Arch. Neurol. Psychiat.*, 1938, **39**, 721.
McGrath, F. S. D., Ryan, J. P., and Fennelly, J. J., *J. Irish Med. Ass.*, 1956, **39**, 1.
McMurdoch, J., *Pharmac. J.*, 1957, **178**, 281.
Mayer-Gross, W., Slater, E., and Roth, M., *Clin. Psychiat.*, 1954. London: Cassell and Co.
Meduna, L., *Die Konvulsiontherapie der Schizophrenie*, 1937. Markolh.
Idem and Friedman, E., *J. Amer. Med. Ass.*, 1939, **112**, 501.
Meyerson, A., *Amer. J. Psychiat.*, 1939, **95**, 1197.
Moore, J. N., and Martin, E. A., *Brit. Med. J.*, 1957, *i*, 8.
Muller, M., *Schweiz. Arch.*, 1935, **9**, 21.
Pachter, M., *Amer. J. Psychiat.*, 1957, **113**, 931.
Partridge, M., *Prefrontal Leucotomy*, 1950. Oxford: Blackwell.

Pollack, B., *Psychiat. Quart.*, 1955, **29,** 439.

Idem, *Med. Times*, 1955, **83,** 439.

Idem, *Amer. J. Psychiat.*, 1956, **112,** 937.

Pollock, H. M., *Psychiat. Quart.*, 1939, **13,** 558.

Reitman, F., *Lancet*, 1939, *i*, 439.

Report on Tranquillizers, *Brit. Med. J.*, 1956, *ii*, 154.

Ross, J. R., and Malzberg, B., *Amer. J. Psychiat.*, 1939, **96,** 297.

Sainz, A., *Prescriber*, 1955, **2,** 14.

Sakel, M., *Neue Behandlungsmethode der Schizophrenie*, 1935. Vienna and Leipzig.

Schlichter, W., Bristow, M., Schultz, S., and Henderson, A. L., *Can. Med. Ass. J.*, 1956, **74,** 364.

Schmidt, K. E., *J. Ment. Sci.*, 1957, **103,** 200.

Shatin, L., Rochmore, L., and Funk, I. C., *Psychiat. Quart.*, 1956, **30,** 402.

Shepherd, M., *Proc. Roy. Soc. Med.*, 1956, **49,** 849.

Stengel, E., *J. Ment. Sci.*, 1950, **96,** 633.

Symons, J. J., *Mental Health*, 1951, **11,** 18.

Vaughan, G. F., Leiberman, D. M., and Cook, L. C., *Lancet*, 1955, *i*, 1083.

Wardell, D. W., *Amer. J. Psychiat.*, 1957, **113,** 745.

Winkelman, N. W., *ibid.*, 1957, **113,** 961.

Wortis J. *ibid.*, 1957, **113,** 611.

THE EFFECTS OF EXPOSURE TIME IN IMMEDIATE RECALL ON ABNORMAL AND QUESTIONNAIRE CRITERIA OF PERSONALITY

By

J. C. BRENGELMANN
Institute of Psychiatry, Maudsley Hospital, Denmark Hill, London, S.E.5

INTRODUCTION

THE present investigation deals with the effects of two lengths of exposure time in neurotic and schizophrenic subjects, and with the relations between these effects and measures of extraversion, neuroticism and rigidity. A consideration of previous work, discussed in the following paragraphs, led to three main predictions concerning varying exposure times.

Firstly, in two experiments using complex visual *learning* stimuli and a constant exposure time of 5 seconds, significant differences were found between neurotics and schizophrenics (3). In the present experiment very similar stimuli were used to measure *immediate recall.* This may introduce a new situation and should be borne in mind whenever facts related to learning and recall are broadly compared. As memory disturbance does not constitute a major clinical symptom of schizophrenia, and as learning impairment *sui generis* is by no means an established fact in schizophrenics, but may rather depend on co-operation (16), it was decided to find an explanation for the observed differences. As a first step, six normal Ss were tested using lysergic acid diethylamide (LSD) to produce schizophrenic-like symptoms and amytal as a possibly antagonistic drug to maximize differences between test scores (5). There was no specific reason for the choice of amytal, other than that LSD is classed as an excitant and amytal as a sedating drug. Highly significant differences were found, using the Figure Reconstruction Test (FRT) described in the present study, for a long exposure of 15 seconds only and not after shorter exposure times (1 and 1/100 second). Error was higher after LSD, as expected. From this, *prediction 1* of the present study was derived: that *neurotics and schizophrenics differ significantly in immediate recall only when a long exposure time is used.* Considerations from the LSD study determined the choice of a 30-seconds and a 2-seconds exposure time for the present study.

Additionally, the hypothesis was advanced that the exposure time effect is related to "rigidity" and should be measurable in neurotics. Following suggestions of Goldstein (14) and Fisher (10), schizophrenics were expected to possess a higher degree of rigidity than neurotics. From this, two further predictions were made. *Prediction 2* states that, with the questionnaires used in the present study, *rigidity is higher for schizophrenics than for neurotics. Prediction 3*, then, assumed *highly rigid neurotics to produce higher immediate recall error than those low in rigidity, selectively at the 30-seconds exposure time.*

The first of the two paper-and-pencil tests used to measure rigidity is the Nigniewitzky *Rigidity Scale* (18), which was found to correlate highly with other known similar scales, leading to a "factor of rigidity". As a second, rather different test, Soueiff's (22) check list to produce *extreme response sets*

(RS) was chosen. Both tests are further described in the method section. Little is known as yet about the personality correlates of RS. Significant relationships of various types of rigidity questionnaires have, however, been reported and discussed on several occasions (22), which appear to justify the selection made.

The choice of memory, or learning, performance as a medium in which rigidity may manifest itself may be considered an obvious one (6, 1). Despite this, quite insufficient relevant experimental facts appear to have been reported to date.

Some *subsidiary aims* of the present study may be formulated as follows. Several personality theorists, using a rather more speculative approach, have preferred the use of single questionnaire criteria in this context. Thus, the Manifest Anxiety Scale (MAS) has played an important part in the work of Taylor, Spence and their co-workers, and the Extraversion Scale of the Maudsley Personality Inventory (8) in the investigations of Eysenck and his associates. The present author believes that the use of single criteria, at the present stage, restricts the sources of individual variation and may bias interpretation in favour of the selected criterion, leaving other, and possibly more important, sources unaccounted for. It is partly for this reason that criteria other than those of rigidity were employed in the present study. These are a scale of extraversion (E) and of neuroticism (N), taken from the Maudsley Personality Inventory.

The N scale was shown to be highly (0·92) correlated with the MAS (13). It may therefore be expected that the present results correspond in nature to those obtained by Taylor, Spence and co-workers. A number of experiments have shown that highly anxious Ss perform less well at more difficult tasks (17, 21). This leads to the expectation that Ss with a high N score would perform less well on the 2 seconds exposure test, as against the 30-seconds exposure. The same might apply, if anything, to the introverts, as MAS correlated negatively with an extraversion scale (Guilford Rathymia, —0·48, 13).

As to extraversion, Eysenck and co-workers (7) expected work decrement, as measured by a pursuit-rotor, to be more rapid and more marked in extraverts, as against introverts. Bearing in mind that the pursuit-rotor presents a task and conditions considerably different from the test used in the present study, a straightforward prediction may not carry much weight. An empirical analysis of the present results, in relation to extraversion, may nevertheless contribute to an assessment of the generality of the factor discussed.

Lastly, it was hoped to define more precisely the personality traits of the non-learner. This problem arose of consistent previous findings that a considerable proportion of neurotics and psychotics did not improve at all in learning (FRT) despite a great number of practice trials (3).

METHOD

1. *The Figure Reconstruction Test* (*FRT*, *Immediate Recall*)

This test has been described in two previous papers (4, 5). In the present study it was used as shown in Figure 1 and the following:

Test shapes. Semi-circle, circle, triangle, square and oblong. Identical in all patterns.

Central reference point. Provided in stimuli and on response sheets of 23 cm. square in both cases.

General instruction. "Draw the five shapes around the central reference point on the response sheet as seen on the screen."

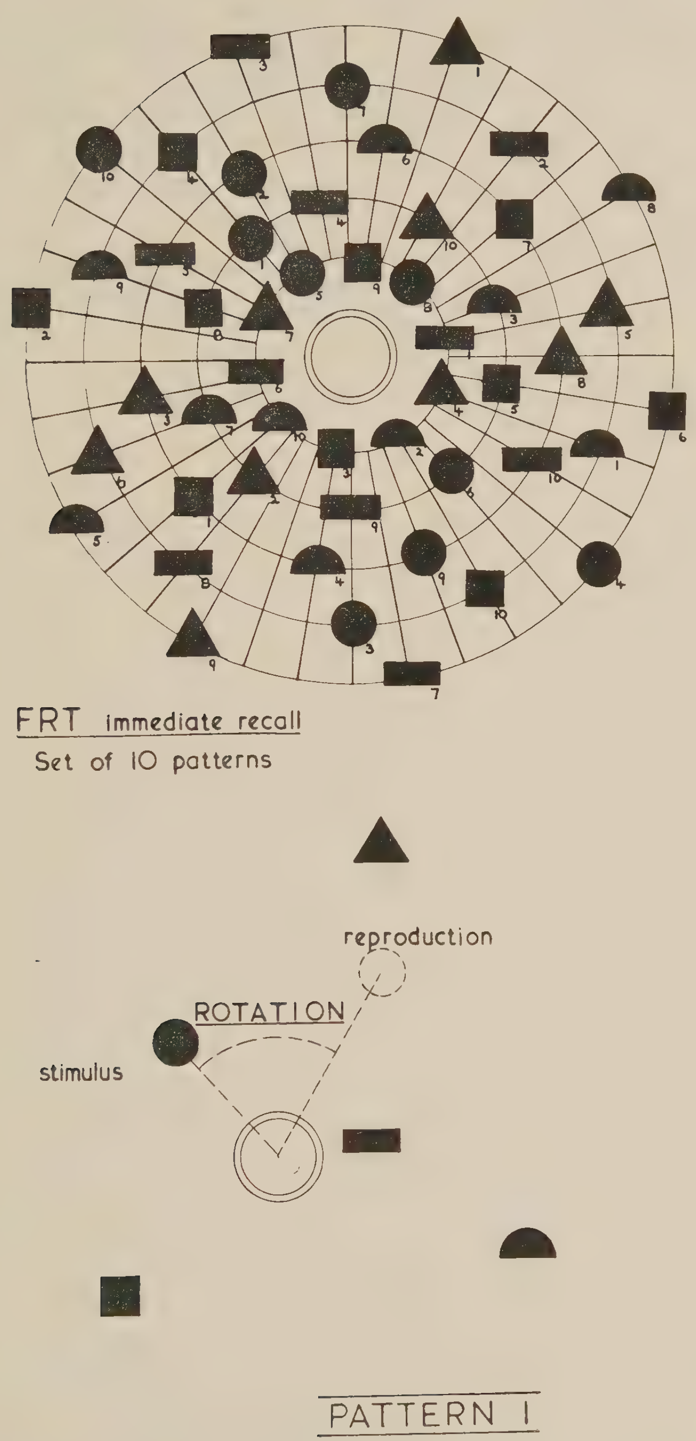

FRT immediate recall
Set of 10 patterns
reproduction
ROTATION
stimulus
PATTERN I

FIG. 1.—*Above:* Complete test set of 10 patterns, distributed evenly. *Below:* Rotation error, or degree of axial displacement, demonstrated for one shape. For one test set, rotation error is the mean degree of rotation of 50 shapes.

Exposure method. Stimuli, drawn in Indian ink on white cardboard, were exposed on a black background. A complete set of the five test shapes, drawn large in a line, was clearly visible to the Ss throughout the experiment, so that type of shapes were known. All shapes *had* to be reproduced after each exposure.

Exposure time. Two conditions, of 30 and 2 seconds duration. Ss viewed stimulus through compur shutter.

Number of test sessions. The two exposure conditions were given twice in succession on successive days.

Balanced design. A total of four parallel sets, of ten patterns each, were prepared and presented in a balanced order.

Scoring rotation error. Rotation error was scored as the mean displacement per shape in degrees around the centre, as demonstrated in Figure 1. This score correlates highly with other types of error, scored from the same reproductions (3). It should be remembered that all shapes had to be reproduced for completeness of scoring.

2. *Personality Questionnaires*

The following scores were derived from all Ss but three schizophrenics:

E=extraversion, 24 items (MPI, Eysenck, 8).

N=neuroticism, 24 items (MPI).

NR=Rigidity, 28 items (Nigniewitzky, 18).

Extreme responses, positive plus negative=101 item adjective check list (Soueiff, 22).

Extreme positive responses=as above.

Questionnaires were provided with "Yes", "No" and "?" response categories. On the E, N and NR scales two points were scored for each answer in the extraverted, neurotic and rigid direction and one point for a question mark.

The *E and N scales* have not stood up to the expectation of representing independent factors, as postulated by Eysenck (8). On a number of occasions, particularly in neurotics, introversion was found to be significantly related to neuroticism (results prepared for publication). The *NR scale*, recently developed, was shown to be fairly highly correlated with Intolerance of Ambiguity (Nigniewitzky), the California Psychological Inventory Rigidity Scale (French), the Rokeach Dogmatism Scale and the California F Scale (18). Factor analysis of the intercorrelations yielded a general factor of rigidity.

Extreme responses were derived from Soueiff's "personal friend" check list (22). Ss describe how much they like or dislike their personal friends of their own sex to have certain characteristics like "agreeing", "dependable", "witty", etc. The following five grades are used: +2, +1, 0, −1, and −2. "Extreme response, positive and negative" was scored as the sum of all +2 and −2. "Extreme positive response", was scored as the total of all +2 answers. The originally shorter list of Soueiff was increased to 101 items in view of a future item analysis.

The *intercorrelations* of the questionnaire scores, used in the present study, were as follows:

48 Neurotics	N	NR	Extr. +2/−2	Extr. +2
E	−0·38	−0·22	−0·07	0·02
N		0·09	0·05	0·09
NR			0·32	0·40
Extr. +2/−2				0·83
Extr. +2				—

Results presented in this paper were analysed as a function of E, N and combined NR/all Extremes. This use of the criteria is open to criticism on the basis of the above relatively high correlation between E and N and relatively low correlation between NR and Extremes. However, analysis showed results to be most profitably used employing this original plan. The combination of NR and Extremes, as careful inspection of the data suggested, did not seem to bias results.

3. *Subjects*

A description of the four groups of Ss used in terms of their mean age and questionnaire responses is shown below (Table I).

TABLE I

Description of Subjects Used in the Present Experiment

Means	Age	E	N	NR	Extr. +2/−2	Extr. +2
24 Male neurotics	34·5	21·6	32·4	30·5	38·2	16·7
24 Female neurotics	32·5	18·9	34·2	23·6	30·5	11·5
12 Male schizophrenics ..	27·5	22·5	32·9	35·5	42·3	23·9
12 Female schizophrenics ..	34·4	21·1*	20·3*	30·2*	31·8*	19·4*

* Scores based on N=9 only.

The *age range* was from 18 to 48 and overall differences between the four groups were not significant. Great care was taken to exclude patients who had received: any shock or drug treatment, other than night sedation, during the period of the present stay in hospital, evidence or suspicion of brain impairment, or damage, and patients considered by their doctor to be unsuitable for testing. Patients were taken off night sedation for two nights before testing started.

As to *diagnosis*, the experimenter relied entirely on the doctor's opinion of whether the patient was "definitely" a schizophrenic or a neurotic. In neurotics, any type of patient was accepted. In schizophrenics, patients whom doctors considered to be depressed were excluded in order to avoid possible interference by this symptom. The clinical diagnosis was either one of paranoia or of schizophrenia simplex.

As most patients are nowadays treated soon after admission by physical methods, as a rule only recent admissions were tested. The present stay in hospital, however, was up to four months. No S had been longer in hospital than one year at any time, nor had he/she been admitted more often than three times in all. This was done in order to avoid effects of long-term hospitalization and deterioration. Additionally, patients were not tested unless they were of "average intelligence", as judged by the ward sister. This, however, applied only in a very few cases. About three-quarters of the schizophrenics and all neurotics were voluntary patients. One of the selected neurotics and six schizophrenics refused to start or to continue testing.

In previous experiments of the present author, neurotics have been classified into clinical sub-categories in accordance with Eysenck's theory of extraversion-introversion (9). This method was abandoned for the present study because it proved an unsatisfactory criterion as regards the FRT. Eysenck's questionnaires may nevertheless be used as suitable personality criteria.

RESULTS

1. *Effect of Exposure Time in Neurotics and Schizophrenics*

Combining Tests 1 and 2, results for the 30-seconds exposure were as follows:

30 Seconds Exposure	12 Male Schizophrenics	12 Female Schizophrenics	24 Male Neurotics	24 Female Neurotics
Mean rotation error Tests 1 and 2 ..	30·33	35·08	24·92	25·63
Variance	86·24	111·90	55·65	44·25

An analysis of variance between these four groups, with 3/68 d.f., resulted in an F-ratio of 5·20, which is significant at the one per cent. level. Both pairs of groups, male schizophrenics and neurotics, as well as female schizophrenics

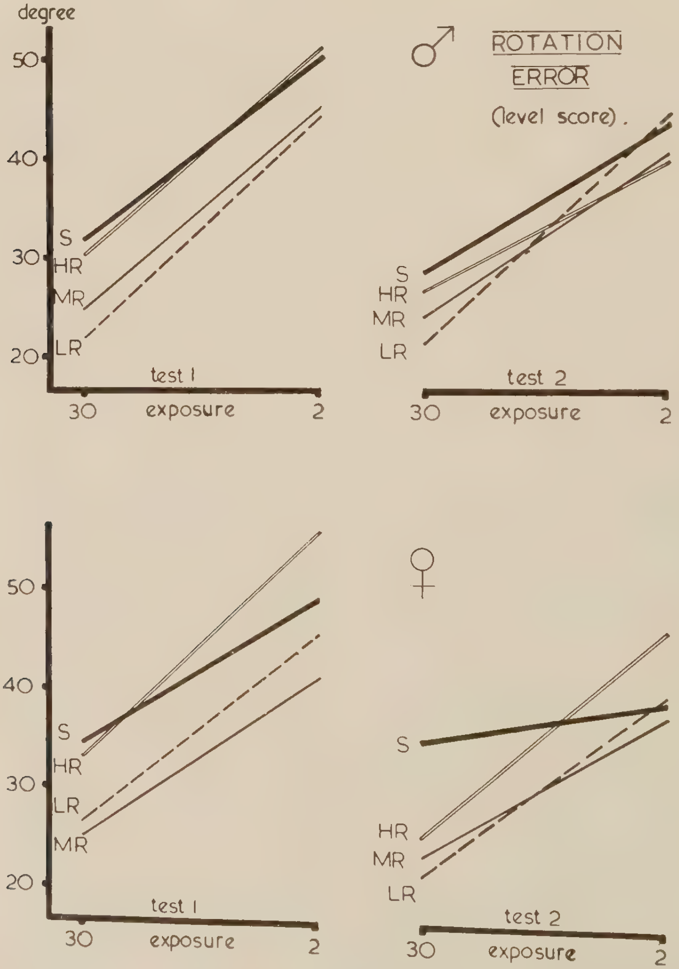


FIG. 2.—Schizophrenics scored significantly more error than the neurotics at the 30 seconds exposure, while performing practically identically at the two seconds exposure. S=schizophrenics; HR, MR and LR=high, medium and low rigid neurotics.

and neurotics, differed significantly as shown by the respective t-ratios of 1·89 (5 per cent., 34 d.f., one tail) and 3·30 (0·5 per cent., 34 d.f., one tail).

There were *no significant differences between the two categories of patients on the two seconds exposure time.* In fact, the overall mean rotation error was practically identical, as may be seen from Figure 2.

Prediction 1 is confirmed in that immediate recall of schizophrenics as against neurotics is specifically impaired after long exposure time.

2. *Differences in Rigidity and Extreme Responses Between Neurotics and Schizophrenics*

To maximize differences male and female subgroups were combined. As was pointed out earlier, three of the 24 schizophrenics refused to complete the questionnaires. Results are stated below:

Rigidity (Nigniewitzky) and Extreme Responses (Soueiff)	Rigidity		Total Extremes		Positive Extremes	
	$\bar{X}$	s^2	$\bar{X}$	s^2	$\bar{X}$	s^2
48 Neurotics	27·04	89·66	34·33	245·42	14·08	79·65
21 Schizophrenics ..	33·24	59·49	37·76	380·59	21·90	229·88
t-ratio (Signif.) (67 d.f., one tail)	2·64 (1%)		0·78 (NS)		2·65 (1%)	

Prediction 2, stating that rigid and extreme responses are more frequent in schizophrenics than in neurotics, is confirmed. It is important to note for future development of such scales, using extreme responses, that the differences regarding this measure were entirely due to the *positive* extremes. Negative extremes were less frequent in schizophrenics than in neurotics.

3. *Exposure Time Effect on Rigidity in Neurotics*

With the second prediction verified, a test of prediction 3 becomes possible. This states that rotation error, using a 30 seconds exposure time, increases with the degree of rigidity in neurotics. Each male and female neurotic subgroup was divided into three equally large groups using the combined rank orders of the NR and total extreme response scores. These subgroups of low, medium and high rigidity consisted then of eight males and females each. Combining sexes, as well as scores derived from Tests 1 and 2, the results were as follows (compare Fig. 2).

30 Seconds Exposure (all neurotics)		"Rigidity" (NR and Extremes Combined)		
		16 Low	16 Medium	16 High
Rotation error (Tests 1 and 2 combined)	$\bar{X}$	22·25	24·44	29·13
	s^2	35·53	43·86	47·85

F-ratio between 3 groups = 5·65 (2/45 d.f., significant at the 1 per cent. level).

Differences were in the expected direction and significant, as shown by the analysis of variance between the three groups. A subsequent t-test analysis, carried out separately for the two sexes, provided the following results.

30 Seconds Rotation Error (Tests 1 and 2 combined)		Low Rigidity	High Rigidity	t-ratio (significant)
Male neurotics	$\bar{X}$	21·88	28·63	1·98
	s^2	43·27	63·41	(5%)
Female neurotics	$\bar{X}$	22·63	29·63	2·51
	s^2	32·55	38·55	(2%)

8 Ss in each of the 4 subgroups; 14 d.f., one tail tests. Rigidity=NR and extreme response combined.

A similar analysis, conducted for the 2 seconds exposure time, did not reveal any significant differences, although it may be seen from Figure 2 that highly rigid neurotics scored more error than patients of medium and low degree of rigidity. A comparison of high and low rigid subgroups resulted in a t-ratio of 1·30 (30 d.f.) and one of high with combined medium and low rigidity in a corresponding ratio of 1·67 (46 d.f.). *Prediction 3* may thus be considered verified that rotation error increases with the degree of rigidity in neurotics, provided a long exposure time is used. It may be mentioned, finally, that in both males and females not the low but the medium subgroup scored lowest error.

4. *Extraversion Score and the Exposure Time Effect*

Males and females were divided into three subgroups of equal size. The mean rotation scores were as follows (Table II).

TABLE II

Mean Rotation Error Scores Pertaining to Figure 3, Upper Part

	Mean Rotation Error		Introverts	Medium Group	Extraverts
MALES	Test 1	30 seconds	24·9	26·8	25·3
		2 seconds	44·5	45·3	50·3
	Test 2	30 seconds	25·0	24·9	21·3
		2 seconds	36·4	35·1	52·1
FEMALES	Test 1	30 seconds	26·0	30·5	28·5
		2 seconds	47·9	47·1	47·8
	Test 2	30 seconds	20·8	25·1	24·9
		2 seconds	33·5	38·6	51·6

From this table it may be seen that the largest and most consistent differences in means appeared at Test 2 (retest after 24 hours), using the 2 seconds exposure time. These relationships are further demonstrated in Figure 3, upper part.

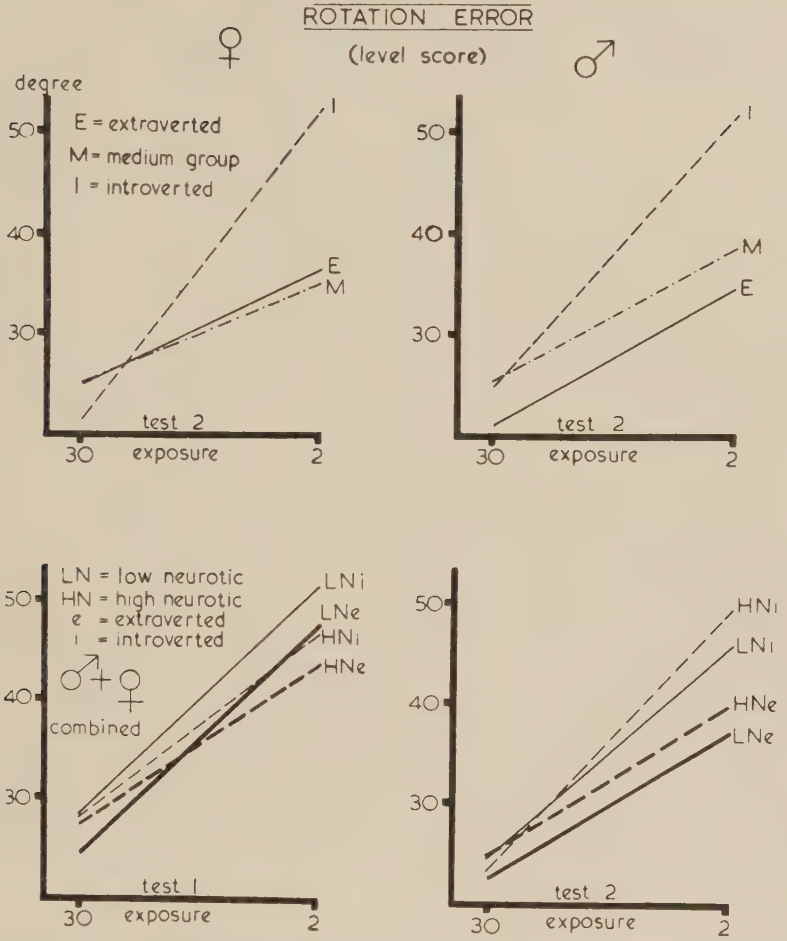


FIG. 3.—*Upper part:* At the 2 seconds exposure introverts scored significantly higher error than the other groups. *Lower part:* Tendency of error to increase with neuroticism after practice.

A corresponding analysis of variance for the 2 seconds exposure (Test 2) showed differences between the three groups, sexes combined, to be significant, as seen below.

2 Seconds Exposure Rotation Error	16 Extraverted	16 Medium Group	16 Introverted
Mean	34·94	36·88	51·88
Variance	122·20	92·78	111·85

F-ratio between 3 groups = 12·62 (2/45 d.f., 0·1 per cent. level of significance). Test 2 only, males and females combined.

t-ratios between the combined medium and high extraverts and the introverts were as follows:

2 Seconds Exposure Rotation Error		Introverts (8 per subgroup)	Medium and High Extraverts (16 per subgroup)	t-ratio (significant)
Males ..	$\bar{X}$	52·12	35·75	3·53
	s^2	169·55	88·87	(1%)
Females ..	$\bar{X}$	51·63	36·06	3·43
	s^2	69·98	128·06	(1%)

22 d.f., two-tail tests.

The conclusion may be drawn that, using a 2 seconds exposure time, rotation error of the introverts was significantly worse than that of the remaining subgroups.

5. *Neuroticism Score and the Exposure Time Effect*

This score was not significantly related to the effect discussed. Neurotics, however, who scored high on N, as against low N, had a slightly lower mean rotation error score on Test 1 as against a slightly higher one at Test 2, considering the 2 seconds exposure only. This observation, made from Figure 3, lower part, is discussed further under "practice effects". In this Figure, the 48 neurotics were divided first into two groups of the 24 most extraverted and 24 most introverted subjects, thus considering the already noted extraversion effect. These subgroups were halved on the basis of the N scores as criteria for high and low neuroticism. It appears that in both, the introverted and the extraverted subgroup, rotation error is higher by approximately the same degree for the "more neurotic" portion. This effect did not approach the 5 per cent. level of significance.

6. *Practice Effects*

A substantial proportion of both the neurotics and schizophrenics showed no gains with practice between Tests 1 and 2, as demonstrated in the following:

Percentage Non-learners	Exposure 30 Seconds	Exposure 2 Seconds
24 Schizophrenics	37	37
48 Neurotics	35	40

These results are remarkably similar between the two groups of patients as well as between the exposure times. The following analysis, shown in Figure 4, describes in more detail the relationship between practice effects and questionnaire scores. Each time, subgroups represent half the entire number of Ss in the neurotics. The schizophrenic groups are added for comparison.

A complete agreement between males and females can be seen as far as trends of curves and means at the 2 seconds exposure are concerned. With 30 seconds of exposure, positions of means of male and female neurotics disagree consistently. An analysis of variance, testing the various components against

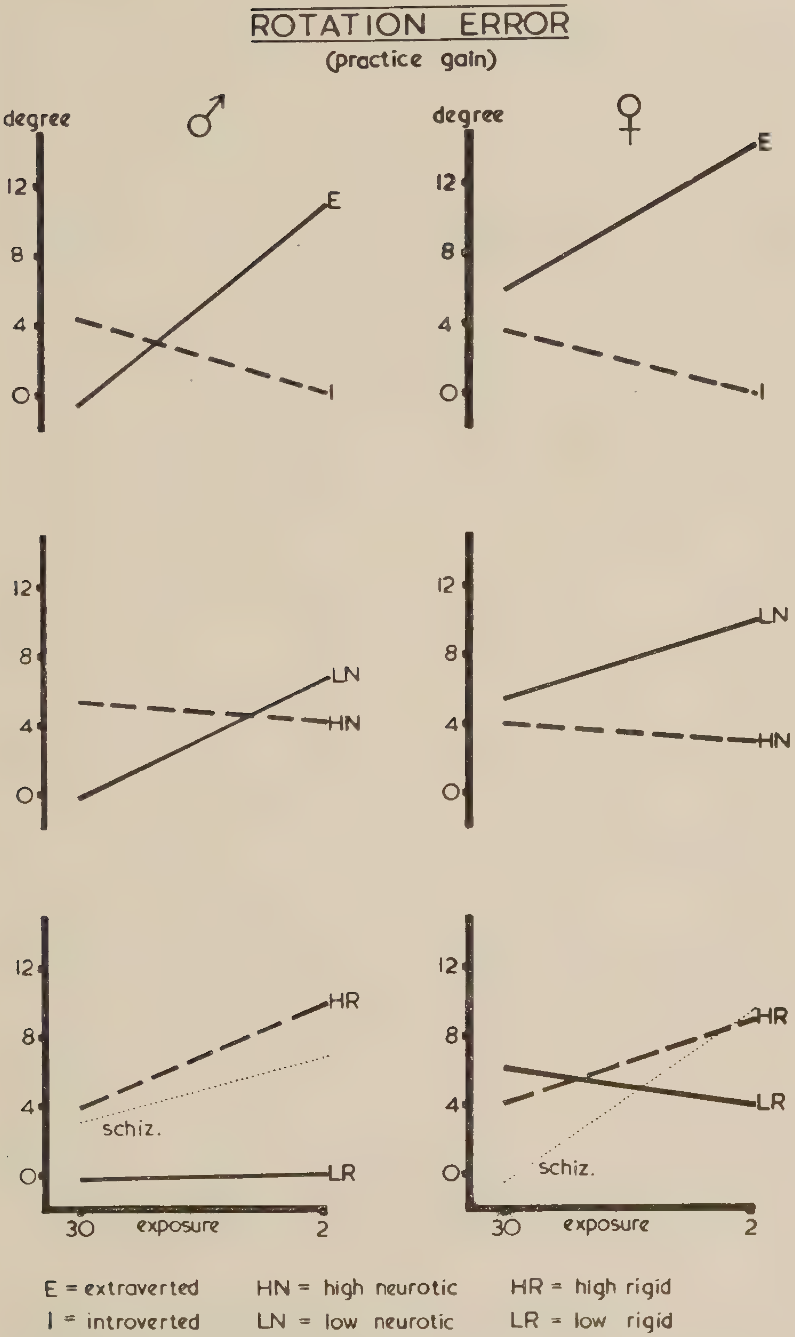


FIG. 4.—Mean practice scores for Tests 1 and 2. N=12 per subgroup.

the residual, was performed separately for E, N and R. Subgroups differed significantly in the case of extraversion and rigidity, as seen in the following:

F-ratio (Significant)	Sex	Exposure	Groups	E×G
Extraversion	4·32 (5%)	N.S.	14·47 (0·1%)	20·10 (0·1%)
Neuroticism	N.S.	N.S.	N.S.	N.S.
Rigidity	N.S.	N.S.	4·49 (5%)	N.S.

1/44 d.f.

A complete statistical description pertaining to Figure 4 is provided in Table III.

TABLE III

Rotation Practice Effects in Degrees Between Tests 1 and 2: Means and Variances Pertaining to Figure 4

Rotation Practice Subgroups with 12 Ss Each		30 Seconds Exposure		2 Seconds Exposure	
		Mean	Variance	Mean	Variance
Male neurotics	E	−0·4	95·0	10·8	115·6
	I	4·3	26·6	0·1	165·7
Female neurotics	E	6·0	123·5	14·2	117·6
	I	3·5	73·9	−1·5	131·5
Male neurotics	HN	5·3	74·4	4·2	238·2
	LN	−1·5	33·5	6·8	102·6
Female neurotics	HN	3·9	74·3	2·8	212·8
	LN	5·6	125·0	9·9	142·3
Male neurotics	HR	4·0	82·0	10·1	103·0
	LR	−0·2	42·0	0·8	194·7
Female neurotics	HR	4·3	81·5	8·5	213·7
	LR	5·2	118·9	4·2	159·1
Male schizophrenics		3·2	108·5	6·9	230·8
Female schizophrenics		−0·5	111·4	9·5	121·4

E=extraversion. I=introversion. N=neuroticism. R=rigidity. H=high. L=low.

Following this, a t-test analysis was carried out. For the *30 seconds exposure* no significant differences were found between any of the pairs of groups shown in Table III. For the *2 seconds exposure*, results were as follows:

t-ratio (significant)	Extraverted *vs.* Introverted	High Neurotic *vs.* Low Neurotic	High Rigidity *vs.* Low Rigidity
Male neurotics	2·22 (5%)	N.S.	2·19 (5%)
Female neurotics	3·44 (1%)	N.S.	N.S.
Combined males and females	4·03 (0·1%)	N.S.	3·21 (1%)

22 d.f. for single, 46 d.f. for combined groups. Two-tail tests

The conclusion is drawn that practice effect was significantly associated with extraversion and rigidity, but not with neuroticism. The consistent tendency for high neurotic persons to improve less should, nevertheless, be noted. Schizophrenics, under the present conditions, were not significantly different from the neurotics. The trend is pointed out that schizophrenics gained *less* with the 30 seconds and *more* with the 2 seconds exposure than the neurotics taken together, as follows:

Mean Practice Effect	Exposure 30 Seconds	2 Seconds
24 Schizophrenics	1·3	8·2
24 Male neurotics	1·9	5·4
24 Female neurotics	4·8	6·3

7. *Practice Effects for Combined Criteria*

In Figure 4, it was shown that high rigid and extraverted neurotics learned considerably faster than low rigid and introverted subjects. This effect was practically independent of the respective subgroup's initial error scores (Test 1), because of the lack of significant differences between any of them. The feasibility of combining criteria with the aim of better differentiation is for this reason and for the differential functional effects involved suggested in the following. Ss who scored above the group mean of both rigidity and extraversion are now compared with those who scored consistently below. Of the male neurotics 14 Ss and of the females 12 Ss fulfilled this criterion. Firstly, it is shown that the mean practice scores of the selected groups are well outside those of the unselected groups, represented in Figure 4.

Mean Rotation Practice	Males	Females
HR/E (selected)	13·1	18·3
Entire group	5·4	6·3
LR/I (selected)	—4·0	—1·7

The individual scores of the selected groups were as follows:

14 Males		12 Females	
HR/E	LR/I	HR/E	LR/I
20	—2	22	—19
1	—19	24	—4
17	—14	0*	—8/M
—4*	—12	16	5/M
16/M	—8/M	28/M	—1/M
21/M	4/M	20/M	17/M
21/M	23/M		

* Ss with extremely low error score at Test 1. M=Ss scoring in the medium third portion of rigidity, rest scoring extreme.

Considering the fact that the lowest scoring S in each male and female HR/E subgroup had an extremely low error score at Test 1 and, therefore, could hardly be expected to improve considerably, the differences between the two sets of individual scores are consistently high. A possible tendency for E with a medium rigidity score, designated as M, to show greatest practice gains should be noted for future work. Finally, it may be mentioned that using the combined rank order of *practice* and Test 2 *level* scores (2 seconds exposure only), *only one person* was misclassified and another one ended in a tie in both the male and female group.

8. *Intercorrelations of Rotation Error Scores*

The following coefficients of correlation were obtained, based on all 48 neurotics.

Level score:	2 seconds—Test 1	*vs.*	30 seconds—Test 1	0·48
	2 seconds—Test 2	*vs.*	30 seconds—Test 2	0·41
Practice score:	2 seconds	*vs.*	30 seconds	0·28

The level score intercorrelations are rather low considering that the task was identical in nature and difficulty, and was exposed only under somewhat different conditions. The corresponding correlations between the two practice scores is, as expected, lower still and just about significant at the 5 per cent. level only. The problem arising from this is: which personality factors interfere with performance so seriously as to render practice effects of two identical tasks, under slightly varying conditions, highly "specific"? This point is analysed in the following paragraph.

9. *Correlations Between Error and Questionnaire Scores*

Error level and practice scores were correlated with the questionnaire scores as follows (N=48 neurotics):

Correlations	Level Test 1		Level Test 2		Practice	
(Exposure seconds)	2	30	2	30	2	30
Extraversion ..	–0·08	–0·20	**–0·44**[2]	–0·01	**0·35**[1]	–0·17
Neuroticism ..	0·01	0·27	0·17	0·21	–0·16	0·06
Nign.—Rigidity	**0·28**[1]	**0·31**[1]	0·09	0·03	0·19	0·25
Extremes (+2/–2)	0·16	0·16	0·08	0·17	0·07	–0·01

Significance: [1]=5 per cent.; [2]=1 per cent. level.

From this at least two points may be noted. *Firstly*, extraversion correlated higher (–0·44) with the 2 seconds level score (Test 2) than the 30 seconds level score (0·41, paragraph 8). Correspondingly, extraversion correlated higher (0·35) with the 2 seconds practice score than the 30 seconds practice score (0·28). *Secondly*, rigidity (NR) correlated significantly with error level at Test 1 only, regardless of the exposure time. At Test 2, the corresponding correlations were practically zero.

From this the conclusion may be drawn that personality factors interfere with level and practice scores to a degree at least as high as does the ability to perform an identical type of test, presented under somewhat different conditions of exposure time. These effects appear to bear specific time relationships. It is suggested that the effect of extraversion increases from practically zero significantly with practice under short exposure time conditions only. With prolonged exposure (30 seconds) the opposite trend is noted. Rigidity, as measured by the Nigniewitzky scale, reveals a different type of effect. This trait is positively related to error in initial stages of practice under both exposure conditions alike. The effect is reduced with practice and almost completely removed at the second test.

DISCUSSION

The main aim of the present paper, regarding a specific recall impairment after long exposure, has been fulfilled. Schizophrenics, as against neurotics, and Ss with high, as against low degree of rigidity, differed in the expected directions. This finding explains why, on two previous occasions, schizophrenics were found to be worse learners than neurotics (3), simply on account of the sufficiently long exposure time used.

The fact that the short (2 seconds) exposure time did not yield significant differences with the same criteria exactly parallels the differences found between LSD and amytal (5). Together with the greater mean practice gain in schizophrenics at the 2 seconds exposure, as compared with the neurotics, a further suggestion may be made. It may be assumed that poorer performance of schizophrenics is basically dependent on experimental conditions of the kind described, rather than on level of co-operation, which was shown by Huston and Shakow (16) to be an important variable and that co-operation itself is a function of such conditions. The selectively long exposure impairment of schizophrenics, rigid neurotics and normals after LSD administration aptly fits the observation of a lacking "ability to maintain a level of mental preparedness" over a long time (15).

The expectation that highly neurotic and introverted Ss are more affected by a complex (2 seconds exposure) task than their counterparts, given a certain amount of practice, has been realized. Thus, results achieved with the MAS, described in the introduction, are paralleled using a rather different test as well as conditions. The more recent results of Saltz and Hoehn (20), as described in their Figure 1, are almost exactly duplicated despite a widely different technique. It should, however, be borne in mind, as demonstrated in Figure 3, that the "neuroticism content" of the MAS is not likely to be as much responsible for the results obtained as is the "introversion content" (compare introduction). Finally, it may be stated that significant differentiation, hitherto obtained with the MAS, was with difficult or complex tasks and not with easy tasks. With the present results, regarding rigidity, it has been demonstrated that rather independent traits or motivations should be considered at different levels.

This is brought out in Figures 2–4, as well as in the correlations between tests and questionnaires. Extraversion and rigidity appear to have quite specific exposure time and practice stage relationships with error. It is evident from this that an investigation might profitably be made seeking to determine directly the interference of the most relevant personality factors with various stages of practice, as has been done for ability and cognitive tests by Fleishman and Hempel (11, 12). Changes in factor structure at various such stages, have by these authors, been investigated and interpreted to the exclusion of personality terms, which can now confidently be expected to play a considerable role.

The finding that extraverts improved considerably faster than introverts on the 2 seconds exposure does not appear consistent with Eysenck's expectation that, with increasing practice, introverts improve faster (7). Additionally, using a 5 seconds exposure time, a number of previously tested groups of normals and neurotics, classified as extraverts and introverts in the Eysenckian sense, showed extraverts to be faster learners than their counterparts (3). These differences, as stated in the introduction, may be due to the selection of test and conditions in the present study.

A few further points may be noted. Correlations between rigidity and error level were significant at Test 1 and almost zero at Test 2. This did not appear to affect the differentiation between the groups which, in fact, became clearer as to the group placement (Fig. 2). Similarly, both high rigid and extraverted Ss were the fastest learners and showed identical functional relationships despite the *negative* correlation between NR and E ($-0{\cdot}22$). It should also be realized that the effect related to rigidity, under the present test and exposure conditions, did not disappear with practice, as has been the case in other types of investigations. This is inconsistent with the sometimes held belief that rigidity manifests itself only in situational anxiety and disappears with practice.

In questionnaires, females were less rigid and used fewer extreme responses, which is well in agreement with the usual findings (19, 23). This sex difference, however, did not become manifest in the objective test results.

As a final point, attention is drawn to the result that only *positive* extreme responses differentiated schizophrenics from neurotics. A pending analysis to this point has, in the meantime, shown that only positive extremes were consistently positively correlated with the Nigniewitzky Rigidity Scale, using a number of independent samples of normals and neurotics. This is considered to agree with the finding of Block and Petersen (2) that "overly confident people tended to be rigid and dogmatic". A present item analysis of the Soueiff check list reveals that various groups of neurotics, drawn from different hospitals, tended to make significantly more negative responses than normals and schizophrenics. Additionally, it is found that schizophrenics differ in content of the items responded to in extremes. From this discussion it may be seen that the author is by no means satisfied with the criteria of rigidity, as used in the present study. They have, however, served to further the analysis on a number of points.

LITERATURE

1. AINSWORTH, L. H., *A Study of Rigidity*, 1953. Ph.D. Thesis, London University.
2. BLOCK, J., and PETERSEN, P., "Some personality correlates of confidence, caution, and speed in a decision situation", *J. abnorm. soc. Psychol.*, 1955, **51,** 34–41.
3. BRENGELMANN, J. C., "Learning in neurotics and psychotics". *Acta psychol.*, 1958, **13,** 371.
4. *Idem*, "d-amphetamine and amytal: I. Effects on memory and expressive movement". *J. Ment. Sci.*, 1958, **104,** 153.
5. *Idem*, "Differential effects of lysergic acid and sodium amytal on immediate memory and expressive movement". *J. Ment. Sci.*, 1958, **104,** 144.
6. CATTELL, R. B., and TINER, L. G., "The varieties of structural rigidity", *J. Pers.*, 1949, **17,** 321–341.
7. EYSENCK, H. J., CASEY, S., and TROUTON, D. S., "Drugs and personality. II. The effect of stimulant and depressant drugs on continuous work", *J. Ment. Sci.*, 1957, **103,** 645–649.
8. *Idem*, "The questionnaire measurement of extraversion and neuroticism". *Riv. psychol.*, 1956, **50,** 113.
9. *Idem*, *The Dynamics of Anxiety and Hysteria*, 1957. London: Routledge and Kegan Paul.
10. FISHER, S., "An overview of trends in research dealing with personality rigidity", *J. Pers.*, 1949, **17,** 342–351.
11. FLEISHMAN, E. A. F., and HEMPEL, W. E., JR., "Changes in factor structure of a complex psychomotor test as a function of practice", *Psychometrika*, 1954, **19,** 239–252.
12. *Iidem*, "The relation between abilities and improvement with practice in a visual discrimination task", *J. exp. Psychol.*, 1955, **49,** 301–312.
13. FRANKS, C. M., "L'échelle de Taylor et l'analyse dimensionelle de l'anxiété", *Rev. psychol. appl.*, 1956, **6,** 35–44.
14. GOLDSTEIN, K., "Concerning rigidity", *Charact. and Personal.*, 1943, **11,** 209–226.
15. HUSTON, P. E., SHAKOW, D., and RIGGS, L. A., "Studies of motor function in schizophrenia: II. Reaction time", *J. gen. Psychol.*, 1937, **16,** 39–82.
16. HUSTON, P. E., and SHAKOW, D., "Learning in schizophrenia: I. Pursuit learning", *J. Pers.*, 1948, **17,** 52–74.
17. KORCHIN, S. J., and LEVINE, S., "Anxiety and verbal learning", *J. abnorm. soc. Psychol.*, 1957, **54,** 234–240.
18. NIGNIEWITZKY, R. D., *A Statistical Study of Rigidity as a Personality Variable*, 1955. M.A. Thesis, University of London.
19. RAPAPORT, G. M., and BERG, I. A., "Response sets in a multiple-choice test", *Educ. physiol. Measmt.*, 1955, **15,** 58–62.
20. SALTZ, E., and HOEHN, A. J., "A test of the Taylor-Spence theory of anxiety", *J. abnorm. soc. Psychol.*, 1957, **54,** 114–117.
21. SARASON, I. G., "Effect of anxiety and two kinds of motivating instructions on verbal learning", *J. abnorm. soc. Psychol.*, 1957, **54,** 166–171.
22. SOUEIFF, M. I., "Extreme response sets as a measure of intolerance of ambiguity". (To appear in *Brit. J. Psychol.*)
23. TERMAN, L. M., and MILES, C. C., *Sex and Personality*, 1936. New York: McGraw-Hill.

EFFECTS OF E.C.T. UPON PSYCHOMOTOR SPEED AND THE "DISTRACTION EFFECT" IN DEPRESSED PSYCHIATRIC PATIENTS*

By

M. B. SHAPIRO, M.A., Ph.D.

Senior Lecturer
Department of Psychology, Institute of Psychiatry, Maudsley Hospital, London

D. CAMPBELL, B.A., Ph.D.

Lecturer
Department of Psychology, University of Auckland, New Zealand

A. HARRIS, M.A., M.D., D.P.M.

Consultant Physician
Bethlem Royal and Maudsley Hospitals, London

and

J. P. DEWSBERY, B.M., B.Ch., M.R.C.P., D.P.M.

Consultant Physician
Maudsley Hospital, London

INTRODUCTION

THE investigation described in this paper had two aims. The first of these was to determine the effects of E.C.T. on psychomotor slowness. As has been reported elsewhere (Shapiro and Nelson, 1955), psychiatric patients of the major diagnostic categories have been found to be slower than normal subjects on psychomotor tests. In addition it has been found that such slowness is correlated with subjective estimates by psychiatrists of degree of illness. As E.C.T. is given in order to improve the clinical condition of depressed patients, it was of interest to ascertain the effect of E.C.T. upon slowness.

The second aim was to determine the influence of E.C.T. upon the "distraction effect" in the Porteus Maze test. This test consists of a series of mazes printed on paper. The subject has to trace his way out of each maze, using a pencil. Foulds (1952), using this test in a modified form, found that depressed patients, when they had to carry out the test under conditions of distraction, speeded up to a greater degree than did a group of psychopaths and hysterics. The distraction consisted of the subject counting aloud, after the experimenter, at the rate of about one number every two seconds, while he was doing the test.

Foulds had been led to this observation from a consideration of possible explanations of the beneficial effects of E.C.T. One possible explanation was that E.C.T. inhibited the preoccupations of depressed patients. Foulds thought that these preoccupations could be regarded as a cause of slowness in dysthymic patients, and that there was an analogy between the presumed effects of E.C.T. and the use of distraction stimulation. He suggested that both acted to inhibit

---

* The research reported in this paper was carried out on the basis of a grant by the Medical Research Council.

the preoccupations, and both enabled the patient to pay more attention to the task in hand. It follows from this analysis that the distraction effect should be smaller after E.C.T. than before.

If this explanation is correct E.C.T. ought to speed up depressed patients, and lessen the distraction effect. Foulds did in fact report that patients were considerably faster after E.C.T. on Raven's Matrices, and that the distraction effect was less on the Porteus Mazes (Foulds, 1952). He did not, however, use a control group in this part of his experiment, and it was therefore of interest to repeat the experiment with a control group.

General Procedure and Selection of Subjects

Two groups of patients were used in the experiment. The experimental group was given a battery of tests, to be described later, and then received E.C.T. The treatment was ended on purely clinical grounds and then the battery was given once again. The control group was also tested twice, but did not receive E.C.T. between the two test sessions. There were 15 subjects in the experimental group and 15 subjects in the control group.

The subjects were all patients of the Maudsley and Bethlem Royal Hospitals. Some were in-patients, others were day-hospital patients who spent weekdays at the hospital, but went home each evening. A patient was selected for the experiment if the consultant in charge of the case (Dr. Harris or Dr. Dewsbery) agreed that E.C.T. was necessary for the treatment of his depressive illness.

The indication for the administration of E.C.T. was a state of depression which had lasted for at least a month, and was showing no tendency to improve or was getting worse. The existence of depression was presumed from the patient's general air of misery, from his subjective complaints of feeling low, and from such features as ideas of guilt and self-reproach or delusions of impending disaster. There was a tendency for those patients whose depression was severe to be given E.C.T. earlier in the course of their illness than those patients whose depression was milder.

The patients were allotted at random to the two groups, independently of the doctors, by one of the psychologists (D.C.) with the exception of the first five subjects, who were all put in the experimental group. The doctors were asked to proceed with treatment of patients in the experimental group, and to defer the treatment of patients in the control group.

The E.C.T. technique for these patients was standardized throughout the two hospitals; the Strauss-McPhail "Plexacon" apparatus being used at the time of the experiment.

Modification was achieved with suxethonium bromide (Brevidil "E") and thiopentone, intravenously. The current administered was usually biphasic and at about 30–35 joules, but varied somewhat with individual patients. If no convulsion was obtained with the first shock, a second shock was administered. Only in isolated cases was a third shock delivered.

Anoxia was avoided by administration of oxygen with 7 per cent. CO_2, as soon as the convulsion had ceased.

Only co-operative patients were tested. Testing was begun on five patients who later refused to continue with the tests. In these cases, persuasion was of no avail, and the battery was abandoned. In other cases a great deal of encouragement was given which warded off further refusals. The majority of patients appeared to be very co-operative.

The intelligence of the two groups was assessed by the use of three sub-tests of the Wechsler Intelligence Scale: Vocabulary, Similarities and Block Design. Yates (1954) has reported that the pro-rated score on these tests correlates highly (r = ·97) with the full scale I.Q. The two depressive groups are alike with respect to their mean intelligence which fell in the average range. The means and sigmas are given in Table I.

TABLE I

Wechsler Pro-rated I.Q.s and Ages of Depressive Groups

		Mean	S.D.	Range	t
Experimental	Pro-rated I.Q.	103·00	14·55	85–127	1·154
Control		108·93	13·52	83–139	
Experimental	Age	49·13	11·47	29–68	2·616
Control		38·00	11·78	19–54	

Nor are there significant differences between the two groups on the sub-test weighted scores (Campbell, 1957). The sub-test scores are a more direct measure of performance, as they do not include a correction for age. The mean age of the experimental group was 49·1 years with a standard deviation of 11·47 and a range from 29 to 68. The control group had a mean age of 38 years, with a standard deviation of 11·78 and a range from 19 to 54. The difference between the mean ages of the two groups was significant at the 5 per cent. level. We cannot explain how this came about, and this difference will have to be taken into account in assessing our results.

In addition to the tests of distraction and slowness, other measures were made. We needed to know if the E.C.T. was having the expected effect on our patients, and therefore we applied ratings of clinical state, made by the psychiatrists, and questionnaire measures of degree of depression. These will be described later.

The average gap between the two test sessions was 33 days in the experimental group (range: 51–21 days) and 29 days in the control group (range: 52–22 days). The patients in the experimental group received an average of 5·9 shocks (range: 3–10 shocks).

SLOWNESS

1. *The Measures*

Fourteen tests of psychomotor speed were used in this experiment, and they provided 30 scores. The enlarged number of scores arises out of the fact that in some tests, both starting time and working time were measured. "Starting time" is the time elapsing between the instruction to begin the test, and the time at which the subject actually begins. In addition, some tests provided separate scores for different parts of the test, and for the Mazes both total time and rate were recorded.

(a) *Porteus Mazes.* This test was described briefly in the introduction. Both starting time and tracing time were recorded. There were no instructions concerning speed of work in this test. The Mazes were given twice before treatment and twice after it. The second trial on each occasion was carried out with distraction, whereas the first trial was carried out under ordinary conditions. The scores for each of these trials in this experiment were calculated in two ways: average time and average rate. The latter was obtained by dividing the distance traced (as measured by an opisometer) by the time taken in seconds. All the Maze scores reported in Table III are based on average scores for each subject, i.e. each subject's total score divided by 11, the number of mazes completed by each subject.

(b) *Cancellation Test.* In this test the subject is shown six lines of capital letters in which 50 A's are distributed randomly. The subject is required to strike out each A as he reads through the letters. The scores taken are starting time and working time. Details of this test are given by Kessell (1955). The test was given twice before E.C.T., and the same number of times after E.C.T. In each pair of trials one was given with distraction and one without. The distraction was supplied by a pure tone of 1,000 c.p.s. which the subject heard through headphones at a volume of 60 db. above his threshold. The signal was sounded intermittently for a second at intervals of one second. The threshold was taken as the average of one descending and one ascending trial.

(c) "*Error Free*" *Babcock Tests.* These were seven short tests from the Babcock-Levy Mental Efficiency Scale. They had been found by Shapiro and Nelson (1955) to discriminate between normal and abnormal subjects, and to give measures of psychomotor speed which were free from errors. In every test but two the subject is required to complete, as quickly as possible, a simple manual task. These tasks were: tracing a simple maze, writing his name, writing "United States of America", writing a simple sentence, and the digit symbol test. The exceptions are tests in which the subject has to name everyday objects held up before him, and to name colours appearing on a card.

Fourteen scores were derived from these tests, some consisting of starting times and others of working times. In some cases (for example, the Digit Symbol Test), working times were given for different parts of the same test. The working times were scored in terms of Babcock's weighted scores (1940). Note that a high weighted score indicates a fast performance and a low weighted score a slow performance.

(d) *U.S.E.S. Manual and Finger Dexterity Tests.* (U.S. Employment Service, 1947). The first of these tests involves moving as many small wooden pegs as possible from one set of holes to another, and the reversing of a number of pegs in their holes. The second test requires the assembly and disassembly of bolts and washers. The score for each test is the amount of work done in a set time. The subject is instructed to work as fast as possible. These tests had been found to differentiate between psychotic and non-psychotic subjects (Eysenck, 1955).

(e) *Slowness of Writing.* In this test the subjects are asked to write the word "Rhythm" as *slowly* as they can. It is one of the few tests involving a motor response which showed a significant change after E.C.T. in Callagan's study (1952). The score is the amount of time taken to write the word.

Several of these tests have been given to groups of patient subjects in other experiments. It was possible, therefore, to compare the results of our own subjects with those from other experiments, and thus obtain an indication of the general applicability of our findings.

2. *Test Characteristics of the Subjects*

(a) *Comparison with Other Samples.* On the measures where comparisons were possible between the subjects of this experiment, and subjects used in

TABLE II

Means and Standard Deviations of U.S.E.S. Scores—Manual and Finger Dexterity

	N	Mean	S.D.	t	Mean	S.D.	t	Mean	S.D.	t	Mean	S.D.	t
Our combined depressives . .	30	74·77	8·15	5·10	86·60	12·81	3·49	22·63	3·84	3·52	24·53	4·02	4·94
S. Eysenck's psychotic depressives	55	63·93	11·24		76·48	12·69		19·33	4·60		20·11	3·79	
Our psychotic depressives . .	18	73·33	8·54	1·29	86·72	14·07	0·16	22·89	3·46	0·657	23·56	3·59	1·496
Our neurotic depressives	11	77·36	7·38		85·91	11·64		21·91	4·53		25·82	4·49	

Key:
M = Weighted score for three trials Manual Dexterity (Displacing pegs).
N = Weighted score for three trials Manual Dexterity (Reversing pegs).
O = Weighted score for Assembly Finger Dexterity.
P = Weighted score for Disassembly Finger Dexterity.

TABLE III

	Control Group				Experimental Group				
	First Test		Re-Test		First Test		Re-Test		t's for Difference Score
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	
St.T. Porteus Mazes (O)	4·96	5·60	2·93	2·21	8·97	5·83	6·97	4·09	·016
Tr.T. Porteus Mazes (O)	62·70‡	31·58	43·42‖	22·73	100·99	49·07	76·44†	38·91	·386
Rate Porteus Mazes (O)	·59	·23	·91‖	·37	·36	·22	·49‖	·29	2·526*
St.T. cancellation (O)	·99	·58	1·00	·42	2·38	2·30	1·57	1·01	1·462
Working time cancellation (O)	74·27‡	20·62	65·43	21·44	105·40	32·88	89·18	25·14	·810
St.T. Porteus Mazes (D)	3·63	3·28	2·23†	1·62	3·94	2·87	3·80	1·82	1·170
Tr.T. Porteus Mazes (D)	47·81	31·90	31·22†	14·50	72·86	37·86	54·86†	30·32	·264
Rate Porteus Mazes (D)	·82	·41	1·18‖	·55	·49	·28	·64‖	·34	2·105
St.T. cancellation (D)	·83	·53	·79	·38	2·08	1·98	1·12	·87	1·453
Working time cancellation (D)	71·10	28·69	58·62	16·17	84·89	30·62	71·35†	17·20	·119
Object naming, weighted score	10·27	2·84	12·20†	2·73	8·60	2·64	10·07	3·17	·446
Writing U.S.A., weighted score	13·47	5·38	13·67	5·14	13·47	2·72	13·33	3·06	1·209
Writing name, weighted score	12·60	1·68	12·87	3·16	12·13	3·38	12·20	3·01	·070
Writing sentence, weighted score	16·00	3·14	15·80	2·98	14·93	2·66	14·53	3·25	·214
Maze 1, St.T.	1·15	1·21	·62	·45	1·09	·72	1·12	·90	1·281
Maze 1, Tr.T.	11·45	4·58	12·12	8·26	15·71	7·03	15·73	6·39	·372
Maze 1, weighted score—errors	16·33‡	4·69	16·87	5·88	12·40	4·72	12·47	5·21	·405
Maze 2, St.T.	·69	·43	·63	·30	1·39	1·24	·80†	·43	1·818
Maze 2, Tr.T.	10·82	3·96	10·73	6·44	13·07	4·37	13·80	4·38	·556
Maze 2, weighted score—errors	16·20	5·20	17·47	5·98	13·67	4·61	12·60†	4·29	·164
Colour naming, St.T.	1·10	1·15	1·01	·38	·98	·37	·93	·51	·171
Colour naming, weighted score, line 1	12·93	3·17	14·40	3·27	13·57	4·18	14·20	3·61	·679
Colour naming, weighted score, line 2–5	12·13	2·70	14·60	1·66	13·14	3·90	14·20	3·84	·030
Colour naming, weighted score—errors	12·07	2·96	13·87	3·85	13·07	3·75	13·73	4·03	·719
Digit symbol St.T.	1·09	·51	1·31	·49	1·49	·21	1·64	1·23	·002
Digit symbol, weighted score, line 1	13·47‡	3·44	12·93†	3·43	10·27	3·10	10·53	3·58	2·769§
Digit symbol, weighted score, line 2–5	11·40	3·38	12·00	3·48	10·20	3·26	10·33	3·48	·381
Digit symbol, weighted score—errors	10·80	3·95	11·27	3·97	8·73	5·01	9·47	3·68	·993
U.S.E.S. finger dexterity	78·60	19·04	99·07‖	17·75	69·93	17·35	67·33	26·24	2·333*
U.S.E.S. manual dexterity	65·93	17·67	83·50‖	26·50	64·07	29·14	71·60	24·20	2·441*

St.T.=Time elapsing between instruction to commence and time at which subject actually begins.
Tr.T.=Time elapsing from beginning to end of tracing.
(O)=Ordinary conditions.
(D)=Distraction conditions.

*=Differences significant at 5 per cent. level.
†=A Test-Retest difference at 5 per cent. level.
‡=Significant difference between control and experimental on first test.
§=Differences significant at 2 per cent. level.
‖=A Test-Retest difference at 2 per cent. level.

other experiments, the scores were alike. There was only one clear exception to this—the U.S.E.S. Manual and Finger Dexterity Tests.

The Combined Babcock Score on the seven tests resulted in a mean of 12·32 and a standard deviation of 3·89 for the control and experimental depressive groups taken together. Shapiro and Nelson (1955) reported a mean of 11·59 and a standard deviation of 3·8 for depressives.

On the Porteus Mazes the combined depressive group produced a mean total tracing time of 900·295 seconds, with a standard deviation of 494·714. Foulds' mean for reactive depressives and melancholics was equivalent to 886·35 seconds with a standard deviation of 671·7. Foulds' starting time was 87·62 seconds with a standard deviation of 169·57. The combined depressives of this experiment produced a mean total starting time of 76·58 with a standard deviation of 65·71. While the means of the groups are very similar, the variances are significantly different and exceed the 1 per cent. level. Some of Foulds' subjects must have been producing starting time scores which were very different from ours.

The only results which were available for comparison on the U.S.E.S. Manual and Finger Dexterity tests were those kindly provided privately by S. Eysenck. She had given these to 55 depressives in the course of another investigation. Her results and our results are given in Table II. It should be noted that there are two scores for the Manual Dexterity test (M and N) and two for the Finger Dexterity test (O and P). This arises from the fact that each of these tests had two parts, which were described above. It is clear from this Table that our subjects are faster than Eysenck's, all the differences being significant at well above the ·001 level.

All Eysenck's depressives were diagnosed as psychotics. Neurotics had been carefully excluded. Our own group consisted of 18 psychotic depressives and 11 neurotic depressives. The final diagnosis of the 30th subject was unobtainable at the time of writing. We calculated the means and standard deviation of these two groups separately on each of the four dexterity tests. These are also given in Table II. Our psychotics are slightly slower on two of the sub-tests, and slightly faster on the other two. Our psychotic depressives are still a good deal faster than those of Eysenck.

In the light of these results we must conclude that our depressives are not as slow as *all* other depressives so far measured. It is possible, therefore, that generalizations arising from the work reported in this paper might have limited application. We can, however, say on the basis of the Porteus Maze tracing time results and the Babcock test results, that our groups are comparable for psychomotor speed, with those of Foulds (1952) and of Shapiro and Nelson (1955). Our research is following up findings derived from these two groups.

It should be noted that errors were made by the depressive subjects in doing the supposedly "error-free" Babcock sub-tests. It is unlikely that these mistakes made any material difference to the results. The average number of errors made by each subject was 3·3. The errors were evenly distributed over all the seven sub-tests, and therefore effects due to error in any one score would be small.

(b) *Comparison of Experimental and Control Groups.* When the results of the experimental and control groups were compared, it was found that on four scores (Porteus Mazes Tracing Time ordinary condition, Cancellation Working time ordinary condition, Maze 1 Weighted Score, and Digit Symbol

Line 1 Weighted Score) among the working time scores, the experimental group was significantly slower than the control group (see Table III). The other results showed the same tendency, though in no other cases were the differences significant. The fact that the two groups are consistently different with respect to their initial status on speed sets a problem which will be considered when we assess the results of this experiment.

In retrospect it seems that the type of patient tested appeared to change during the course of the experiment. It will be remembered that the first five patients were assigned to the experimental group. It is possible that the subsequent 25 patients were less seriously ill. There might have been a tendency to avoid notifying the very ill patients to the psychologist when it was realized that it might result in their being held off treatment for a period of time.

3. *Results*

(a) *Main Results*. In the first place both experimental and control groups show an increase of speed on a majority of tests when they are re-tested. Out of 30 variables, 22 show an improvement in the experimental group, and 25 show an improvement in the control group. Nine of the variables on which the control group showed an improvement, and seven of the variables on which the experimental group showed an improvement, gave significant results (see Table III). Note that the Porteus Maze speed is given in both time and rate.

In the second place the amount of improvement in speed was on the whole greater for the control group than for the experimental group. This was demonstrated by calculating, for each subject, the difference between the scores of the first and second performance of each test. For the rest of this paper such differences will be referred to as difference scores. The control group achieved larger improvements than the experimental group on 21 of the speed scores. The "t's" for the difference in improvement are given in Table III. Four of these differences between the means of the improvement scores reached or exceeded the 5 per cent. level of significance. Three of these differences were found in Porteus Maze rate, under ordinary and distraction conditions, and the U.S.E.S. Finger and Manual Dexterity tests. The experimental group showed a significantly larger improvement on only one of the scores from the speed tests. This was the first line of the Digit Symbol Test. This result arises out of the fact that the control group obtained a worse score on re-test, while the experimental group improved slightly. This is possibly a chance effect of an unreliable measure, and would have to be observed in another study before it could be accepted as a reliable result.

(b) *The Influence of Initial Differences in Speed between the Experimental and Control Groups*. It might be argued that the greater improvement shown by the treated group was due to the fact that it was initially the slower group. This argument is, however, contrary to the actual relationship between initial speed and gain on re-test. It has been found by Campbell (1957) that there is in fact a positive correlation between initial speed and gain on re-test. The *slower* the initial performance the *more* the subject gains on re-test. For example, in the case of the Porteus Maze Tr.T. eta (calculated instead of r because of non-linearity of regression) between initial score and improvement, was ·77 ($p = \cdot 01$). The two measures have 59 per cent. of their variance in common.

The initial time score from each of the other 29 variables was similarly correlated with gain on re-test (Campbell, 1957). All the correlations were in the same direction as that found for the Porteus Mazes. Thirteen of them reached the ·01 level of significance. These correlations were, of course, only computed for the control group. These results indicate that the experimental group, as the initially slower group, should have gained more than the control. In fact they gained less. We must conclude, therefore, that the experimental group was slower on the re-test than it would have been without E.C.T.

(c) *Influence of Age on Improvement.* It was pointed out above that the control group was, on the average, eleven years younger than the experimental group. The greater improvement scores in the control group might be attributable to this difference. The possibility was examined by computing rank-order correlations between age and the scores on which the control group had shown a significantly larger improvement. None of the correlation coefficients reached the 5 per cent. level of significance. The largest coefficient was $r = \cdot 38$, and the mean of the coefficient was $-\cdot 060$, that is, about zero. It is unlikely, therefore, that the difference in age influenced the results.

Distraction Effect

1. *The Measures*

Only the results on the Porteus Mazes will be discussed in this part of the paper, as we were not able to find a sufficiently reliable distraction effect in the Cancellation Test (Campbell, 1957). Foulds' procedure was adopted. The distraction, which consisted of having the subject count out aloud after the tester while he was tracing through the mazes was applied in the second set of mazes. The counting began as soon as the maze was placed before the subject, so we have a measure of the distraction effect on both starting time and tracing time.

2. *Test Characteristics of the Subjects*

The score on the distraction trial was expressed by Foulds as a percentage of the score on the trial given in the ordinary way, for both starting and tracing time. These will be referred to as the "tracing time percentage score", and as the "starting time percentage score". The mean tracing time percentage score was 73·52 for the combined depressive group, with a standard deviation of 18·46. Foulds' dysthymic group produced a mean of 70·3 with a standard deviation of 18·75. In this respect Foulds' and our groups seem to be identical.

The mean starting time percentage score for the combined depressives was 76·32 with a standard deviation of 66·34. For Foulds' dysthymics it was 66·33 with a standard deviation of 29·32. Foulds' groups appear to be more homogeneous than ours in the distraction effect on starting time. Given that they were initially more heterogeneous, it seems that the distraction effect on starting time was considerably greater for some members of Foulds' group than for any of our own.

3. *Results*

Tracing time percentage score showed no reaction to practice or E.C.T. as Table IV shows.

For the purpose of the analysis of starting time percentage score, we excluded an outstandingly slow subject from the control group. This subject had a mean starting time score on the first test of 30·55 seconds. The next slowest subject, also a member of the control group, had a mean starting time score of 17·18 seconds. The mean for the whole group was 4·96. To equalize the numbers, we also excluded one subject from the experimental group.

The basis of this second exclusion was merely the fact that the subject had been assigned the same code number as the subject who was excluded from the control group. The results are given in Table IV. The initial mean starting time percentage score of the control group is greater than that of the experimental group, i.e. the control group speeds up less than the experimental group. The difference produced a "t" of 2·053 which is just short of the 5 per cent. level of significance.

TABLE IV

Porteus Maze Distraction Effects in Terms of Percentage Scores

		Experimental		Control	
		Mean	S.D.	Mean	S.D.
Test	Starting time	51·172	34·096	84·934	51·453
	Tracing time	74·251	17·669	72·793	19·821
Re-test	Starting time	62·889	33·237	83·734	23·857
	Tracing time	74·880	22·836	79·630	25·485
Difference scores*	Starting time	138·366	39·360	148·554	44·248
	Tracing time	149·355	25·829	145·151	28·084

* 150 has been added to each score to get rid of minus signs.
St.T. N=14.
Tr.T. N=15.

Examination of Table IV will show that E.C.T. did produce a change in the starting time percentage score in the expected direction. The distraction effect was decreased in the experimental group, being demonstrated by a rise in mean starting time percentage score from 51·172 to 62·889. This change produced a correlated "t" of 1·113 which does not approach an acceptable level of significance. The control group showed no change in means but a reduction in standard deviation.

To complete the analysis the difference scores were calculated and contrary to expectation the mean difference score is smaller for the experimental group than it is for the control group. However, the direction of the difference has no implication here as the "t" is only 0·646. This last finding could not be an artefact of the initial difference between the experimental and control groups, because the experimental group did not, in the first place, show a significant reaction to E.C.T. The results must be accepted therefore as being clearly negative.

AFFECT AND CLINICAL STATE

1. *Measures*

It was necessary to obtain an indication of the extent to which the E.C.T. was having the desired effect on the patients' symptomatology. Two measures were used for this purpose. In the first place the consultant in charge of the case was asked to assess the degree of illness shown by each patient on a five-point rating scale. The criteria were those given by Shapiro and Nelson (1955). The definition of the values on the scale were:

(i) Apparent full remission.
(ii) Depression without gross depression in the patients' appearance.
(iii) Simple depression.
(iv) Severe depression with delusions and hallucinations but in good contact.
(v) Barely suitable for testing.

The second measure used was the Hildreth Feeling Scale (1946). In this test the subject is shown a set of statements, and is asked to indicate the statements which come nearest to describing how he feels. The statements are arranged in eight sets and each contains between eight and ten statements. Only four of the sets are obviously concerned with affect. The first two of these are concerned with feeling, containing statements such as "never felt better in my life" and "couldn't feel worse". The third set is concerned with energy, containing statements like "completely worn out" and "full of pep". The fourth set is concerned with optimism about the future and contains such statements as "insecure" and "the future doesn't look bad". The four remaining sets are concerned with the subjects' assessment of his mental efficiency, his attitude to his work (one set each) and to other people (two sets). Scores from the first four sets are combined to give a "Feeling" score and from the second four sets to give a total "Attitude" score.

2. *Characteristics of the Subjects*

The mean scores showed that the patients' self-ratings of their level of affect were all below the means reported by Hildreth for a mixed neuropsychiatric medical population, i.e. they were more depressed. Similarly, they gave on an average, lower scores than a group of normal undergraduates tested by Hunt and Lehner (1948). The data are given in Table V.

TABLE V

Hildreth Feeling Scale and Clinical State: Results for Experimental and Control Groups

		Experimental		Control		t	
		Mean	S.D.	Mean	S.D.	Difference	
Test	Feeling scale ..	3·723	1·017	3·493	1·671	·457	—
	Attitude scale	5·307	1·232	4·591	·783	1·813	—
	Clinical state ..	3·200	·414	3·286	·612	·448	—
Re-Test	Feeling scale ..	5·650	1·663	3·953	1·509		
	Attitude scale	6·000	1·171	4·707	1·504		
	Clinical state ..	2·200	·941	2·733	·960	1·532	
Difference scores	Feeling scale ..	1·920	2·030	·457	1·378	2·308	†
	Attitude scale	·690	1·361	·041	1·058	1·436	—
	Clinical state ..	1·000	1·000	·574	·938	·410	—
		Sandler's A Test					
Significance of difference between test and re-test	Feeling scale ..	·136	*	·653	—		
	Attitude scale	·309	—	27·797	—		
	Clinical state ..	·116	†	·250	—		

Key: *=Difference significant at 5 per cent. level.
†=Difference significant at 1 per cent. level.

Data were also available from the Hildreth Feeling and Attitude Scales given to a group of 15 normal subjects (Campbell, 1957). The combined depressives showed lower Feeling and Attitude scores than the normal controls. The difference reached the 1 per cent. level of significance for both scales. The differences between the experimental and control group on the two scales did not reach an acceptable level of significance, giving "t's" of ·457 and 1·813 respectively.

On the rating scale used by the psychiatrists, all patients received either a 3 or 4 rating on the five-point scale. The experimental and control groups were given the same mean rating.

3. *Results*

The mean score of the experimental group after E.C.T. was significantly greater than before E.C.T. on the Hildreth Feeling scale but not so on the Hildreth Attitude scale. The control group showed little change on either scale. The difference in the amount of change, as measured by the difference score, between the experimental and control group was significant at the 5 per cent. level for the Hildreth Feeling Scale.

The most depressed patients on the Hildreth Feeling Scale improved most after E.C.T. on that scale. This is shown by a significant negative rank correlation of $-\cdot 50$ on the Hildreth Feeling Scale between initial score and improvement after E.C.T. The six largest improvements were produced by patients who had scores below $3\cdot 7$, and the three cases who became worse had initial Hildreth scores above this point. We should note that two of the cases of the control group who showed a considerable improvement also had an initial score which was below $3\cdot 7$, while one of the cases with an initial score above $3\cdot 7$ showed a considerable deterioration.

The clinical status of the patients, as assessed by the doctors, also showed an improvement after E.C.T. the difference reaching the 1 per cent. level of significance on Sandler's (1957) A test. Nine of the experimental group were improved, including 5 total remissions. In the control group, 5 cases were rated as improved, including 2 remissions. The difference in the amount of change between the control and experimental group did not however, reach an acceptable level of significance.

The rank-order correlation between amount of change, as measured by the Hildreth Scale and the amount as measured by the clinical assessment, was small for the experimental group. It was $\cdot 47$ which does not reach the 5 per cent. level of significance for an N of 15 subjects.

It is not relevant to the purpose of this paper to discuss the full implications of these results. It suffices for our purpose that we are able to conclude at least on the basis of the Hildreth Scale results, that the E.C.T. did have the desired effect at an acceptable level of statistical significance upon our patients. It follows therefore, that the findings reported in the previous two sections concerning slowness cannot be ascribed to a failure of therapy.

CONCLUSIONS AND DISCUSSION

1. *Conclusions from the Experiment*

Two main results emerge from this experiment. Firstly, E.C.T. did not lead directly to a relative improvement in the psychomotor speed of depressed patients; but in fact, to a relative reduction. Secondly, E.C.T. did not reduce the distraction effect. E.C.T. did, however, decrease the depression of the experimental group.

Two conclusions arise if we take these findings at their face value. First of all, the finding that slowness is correlated with subjective estimates of degree of illness (Shapiro and Nelson, 1955), is now, at best, of limited applicability. It really must be confirmed in further studies before it can be accepted with confidence. The second conclusion is that no analogy can be drawn between the distraction effect and the ameliorative effects of E.C.T.

As against these conclusions it might be argued that the relative slowing down of our experimental group was caused by post-E.C.T. confusional state, and that once this had cleared up, the patients would show the expected increase in speed and decrease in distraction effect.

This explanation appears to us to be unlikely, as our experimental group did not significantly increase their errors compared with the control group (see Table III). However, it is necessary to conduct another study in which the period elapsing after treatment is longer than the interval used in this experiment.

Our conclusions might also be open to question on the grounds that our sample of depressives was unrepresentative. This seems to us to be unlikely. Our samples were very similar to those of Foulds (1952) on the Porteus Maze Tracing Time, in both ordinary and distraction trials. It was also very similar to those of Shapiro and Nelson (1955) on the Babcock speed tests.

2. *Conclusions from the Literature*

In order to throw light on our findings, we scanned the literature. We found four studies which were of some relevance, in that the effects of E.C.T. on speed of psychomotor function had been measured, and that a control group had been used. These four studies were by Hetherington (1956), Callagan (1952), Janis and Astrachan (1951), and Scherer (1951).

The first study, that of Hetherington (1956), produced findings which, at first sight, appeared to contradict our own. He reported that a group of depressed patients were speeded up by E.C.T. on 4 psychomotor tests. Hetherington's findings may be explained by the fact that he used normal subjects in his control group. These subjects were initially faster than the depressives, and therefore we would expect then to gain less than the depressives on re-test, even without the use of E.C.T. This expectation arises out of the findings, reported above, of a negative correlation between initial speed and gain on re-test. Judging by our own results, Hetherington would have got his depressives to improve even more, compared with his normal controls, if he had refrained from giving them E.C.T.

The second study is that of Callagan (1952) who included in his battery seven tests which were comparable with our own. He had 25 depressed patients in his experimental group and 25 depressives in his control group. None of the differences he found in the seven tests, however, reached an acceptable level of significance when compared with the control group; nor was there a definite trend of improvement or deterioration after E.C.T. Callagan's treated group did improve clinically, as compared with the control group. In addition it should be noted that they were tested 7 days after the cessation of treatment, a period which is comparable with our own which varied from 3 to 8 days. The outstanding difference between Callagan's and our conditions is the number of treatments. His experimental group received E.C.T. a mean number of 8·68 times, while ours received E.C.T. for a mean number of 5·9 times. If anything, this should have made his experimental group slow down even more than ours. It is clear that we are not in a position to explain the difference between Callagan's and our own results.

The third study is that of Janis and Astrachan (1951). This study cannot be regarded as strictly relevant, because only two of the nine members of the experimental group, and five of the eight members of the control group, were depressives. Two variables in this experiment were analogous to our own. The first consisted of times taken to begin answering questions in a life history questionnaire. The second consisted of the response time for the utterance of the whole reply. On both measures the scores deteriorated for most of the experimental group and improved for most of the controls, the difference between the two groups reaching the 1 per cent. level of significance. This study is similar to our own in demonstrating a relative deterioration in speed of performance; but disagrees with ours in demonstrating an absolute deterioration for the experimental group. This finding might be due to the fact that talking is a highly practised activity, and therefore all subjects are very near to their asymptotes for speed on this function. Any factors which made for the lessening of speed might therefore be more readily demonstrated. Two other factors might be responsible for the findings of Janis and Astrachan. In the first place their treated group received an average of 18 treatments compared with our own average of 5·9 treatments. In the second place they differed diagnostically from our groups. The second testing of the experimental group took place not less than four weeks after the last treatment.

The fourth study, that of Scherer (1951) also cannot be regarded as strictly relevant to our own. Of the 41 members of the experimental group only seven were classified as depressives (controls not described). The experimental group was re-tested between 2 and 6 weeks after the last treatment. No change was observed on those tests which were comparable to ours. These tests were the Minnesota Rate of Manipulation test, and the Wechsler Bellevue Digit Symbol test. We ourselves found no change on the last test.

The one generalization which emerges from these four studies and our own, is that E.C.T. does not increase, and may decrease, speed of psychomotor function. This generalization may have some clinical importance. Slowness is a characteristic of the mentally ill, especially the depressed. But it appears that E.C.T. has an ameliorative effect only upon the mood of the patient and does not have a similar effect upon slowness.

In view of these findings it is interesting that the medical collaborators in this research have *not* found that patients return soon after their treatment to complain that they are still as slow as ever, even though their depressions have lifted. Yet, as Lewis (1934) has pointed out, depressed patients complain considerably about their retardation. It is necessary to find out what happens to the retardation of a successfully treated patient after he has left the hospital, and what effect it has on his personal and occupational adjustment.

3. *Implication for Future Research*

Past research upon the effects of E.C.T. has tended to concentrate on cognitive and motor functions, possibly because they appear easier to investigate than affect, and because it is possible to deduce explanations of the effects of E.C.T. from its effects on such functions. For example we have the theory of Janis and Astrachan (1951) that the general impairment of memory by E.C.T. is followed by a selective revival of memories. Less pleasant memories are not so quickly or completely revived after E.C.T. Another example is the argument that there is a tendency to lose recently acquired habits. Hence those associated with a recently acquired depression might be selectively affected by E.C.T.

The concentration, in the research into effects of E.C.T., on cognitive functions, need not necessarily lead to an understanding of the efficacy of E.C.T. The results of this experiment suggest that the cognitive and motor effects of E.C.T. might be relatively independent of changes of other characteristics. In view of this, it might be more fruitful to investigate affective and other symptomatic changes directly, and not to assume that they are the by-products of changes in cognitive processes.

At first sight, research into affect appears to be very difficult. However, the questionnaire approach to affective change might provide useful leads. This is shown by the significant negative correlation obtained between initial depression and the amount of change after E.C.T. on the Hildreth Feeling Scale, and by the fact that the Hildreth Feeling Scale appeared to be more sensitive to E.C.T. than our clinical ratings. At present there are no experimentally based data showing how the various aspects of a depression, such as sadness, fatigue, pessimism, retardation and delusion, are related to each other. Nor do we know how these relations vary in different stages of the illness, and in different patients. It would seem to us that these questions would need to be answered before launching into further experiments on the effects of E.C.T. on cognitive function alone.

Summary

This paper reports an investigation of the effects of E.C.T. upon two aspects of psychological function: psychomotor slowness and the distraction effect. Fifteen depressed patients were used as an experimental group and 15, who had also been prescribed E.C.T. for depression, were used as controls. Both groups were tested and re-tested with the same battery of psychomotor tests and Foulds' distraction tests upon the Porteus Mazes. The main outcomes were:

1. E.C.T., if anything, increased relative slowness and had no effect on the distraction effect.
2. E.C.T. had a significant effect on the patients' complaints as measured by the Hildreth Feeling and Attitude Scale.

Acknowledgments

Acknowledgments must be made to Mrs. M. Richardson who carried out a large part of the testing and computations reported in this paper.

References

Babcock, H., and Levy, L., *Examination for the measurement of efficiency of mental functioning*, 1940. Chicago: Stoelting.

Callagan, J. E., *The effect of electro-convulsive therapy on the test performance of hospitalized depressed patients*, 1952. Ph.D. Thesis, University of London.

Campbell, D., *A study of some sensory motor functions in psychiatric patients*, 1957. Ph.D. Thesis, University of London.

Eysenck, S., *A dimensional analysis of mental abnormality*, 1955. Ph.D. Thesis, University of London.

Foulds, G. A., "Temperamental differences in maze performance. II. The effect of distraction and of electroconvulsive therapy on psychomotor retardation", *Brit. J. Psychol.*, 1952, **43**, 33–41.

Hetherington, R., "The effects of E.C.T. on the efficiency and retentivity of depressed patients", *Brit. J. med. Psychol.*, 1956, **29**, 258–269.

Hildreth, H. M., "A battery of feeling and attitude scales for clinical use", *J. clin. Psychol.*, 1946, **2**, 214–221.

Janis, I. L., and Astrachan, M., "The effects of electroconvulsive treatments on memory efficiency", *J. abn. soc. Psychol.*, 1951, **46**, 501–511.

Kessell, R., *An investigation into some of the factors affecting speed of response in psychiatric patients with special reference to distraction*, 1955. Ph.D. Thesis, University of London.

Lewis, A. J., "Melancholia: A clinical survey of depressive states", *J. Ment Sci.*, 1934, **80**, 1–102.

Sandler, J., "A test of the significance of the differences between the means of correlated measures, based on a simplification of students' t", *Brit. J. Psychol.*, 1955, **46**, 225–226.

Scherer, I. W., "The effect of brief stimulus electro-convulsive therapy upon psychological test performance", *J. consult. Psychol.*, 1951, **15**, 430–434.

Shapiro, M. B., and Nelson, E. H., "An investigation of the nature of cognitive impairment in co-operative psychiatric patients". *Brit. J. med. Psychol.*, 1955, **28**, 239–256.

U.S. Employment Service, *General Aptitude Test Battery*, 1947. Washington, D.C.: Department of Labor.

Yates, A. J., *An experimental study of the block design rotation test with special reference to brain damage*, 1954. Ph.D. Thesis, University of London.

HUMORAL CHANGES IN MANIC-DEPRESSIVE PSYCHOSIS WITH PARTICULAR REFERENCE TO THE EXCRETION OF CATECHOL AMINES IN URINE

By

R. STRÖM-OLSEN, M.D., B.Sc., D.P.M.

and

H. WEIL-MALHERBE, M.D., D.Sc.

Runwell Hospital, Wickford, Essex

Psychotic patients with periodically changing symptoms offer particular opportunities for psychosomatic and metabolic studies. Following the classical work of Gjessing (1932, 1935, 1939, 1953) other authors (Ashby, 1952; Rowntree and Kay, 1952; Smith, 1954; Gunne and Gemzell, 1956; Crammer, 1957) have studied metabolic changes in periodic catatonia. Cycles of behaviour and metabolism in psychiatric patients and in patients with "periodic disease" have been reviewed by Richter (1957) who also reported on interesting experiments aimed at the induction of periodic cycles of behaviour in rats.

Earlier investigations in the field of manic-depressive psychosis, particularly the work of Tomasson (1927), were reviewed by McFarland and Goldstein (1939). More recently Dawson *et al.* (1954, 1956) found an increase in the ratio of butane-2:3-diol/acetoin in the blood during the manic phase, which could not be reproduced in normal controls by an increase of physical activity.

In the following we wish to describe investigations on patients with manic-depressive psychosis. In two of them, manic and depressive phases alternated in fairly regular periods. The total twenty-four hour urine output and the twenty-four hour urinary excretion of sodium and potassium, of catechol amines (adrenaline, noradrenaline and 3-hydroxytyramine) and, in some cases, of 5-hydroxyindoleacetic acid have been determined.

METHODS

Collection of 24-hour urine. Twenty-four hour samples of urine were collected once or twice weekly from each case. Treatments were suspended for the duration of the collection and, at least, the preceding twenty-four hours and, as far as possible, the patients were kept under constant supervision. The urine was collected in Winchester quart bottles which had been graduated by pencil marks into 400 ml. sections. Four ml. 10 N-H_2SO_4 were placed into the empty bottle and a further portion of 4 ml. was added every time the urine volume exceeded the graduation mark.

Creatinine estimations served to detect gross losses of urine: twenty-four hour samples with a creatinine content of less than 0·8 g. were rejected. The daily creatinine excretion fluctuated between 0·8 and 1·8 g. Higher values were found on some occasions; they may have been due to dietary factors. We did not feel justified in following the widespread but arbitrary practice of adjusting the excretion of urinary constituents to an assumed constant rate of creatinine output.

Chemical estimations. Catechol amines were estimated fluorimetrically according to Weil-Malherbe and Bone (1957a) with the following modifications: the amount of urine used for the analysis was 25 ml. and the basic fraction was isolated on columns of 0·5 g. of Amberlite IRC-50 as described in the Addendum. The Amberlite column was eluted with 10 ml. N-HCl and the eluate was titrated to pH 3·5 with N-NaOH at the glass electrode and diluted to 25 ml. Samples of 2 ml. were used for the fluorimetric estimations.

Creatinine was estimated by the method of Jaffé (cf. King, 1951). Sodium and potassium were determined with the EEL flame photometer (Evans Electroselenium Ltd., Harlow, Essex) against appropriate standards. The method of Udenfriend, Titus and Weissbach (1955) was used for the estimation of 5-hydroxyindoleacetic acid.

RESULTS

Case 1

Manic-depressive psychosis. A female aged thirty years, married, pykno-athletic build.

A case of alternating insanity where the normal phase was so short as to amount almost to folie circulaire. The psychotic phases lasted from between two and three weeks with an interval of anything from twenty-four hours to a few days of normal behaviour. Her first attack began on 5 November, 1955 with a bout of depression. She had suddenly changed, seemed to lose interest, refused to go to work and became very quiet. She got more and more depressed and expressed suicidal longings. She made an abortive suicidal attempt on 21 November, and was sent to the Out-Patient Clinic where she received treatment and made a good recovery.

She was admitted to hospital in April, 1956, when she was in the middle of a depressive phase. She was discharged six days later.

Her next admission was on 23 August, 1956. After five days she left against advice and was re-admitted under certificate on 31 August, 1956, following another suicidal attempt, and she has remained in hospital continuously since that date. By 6 September, she was beginning to "brighten" and two days later was in a definite hypomanic phase. The hypomanic phase lasted until the end of the month, and by 28 September she was again in a depressed phase which lasted until 14 October, when a hypomanic phase again supervened. These manic and depressive phases followed each other with almost clockwork regularity. There would usually be a "normal" phase of one to two days in between.

In the manic phase the patient showed the fundamental characteristics of her psychosis—euphoria, increased psychomotor activity, a tendency to a flight of ideas, and heightened distractibility. She would laugh and crack jokes and make personal remarks, and be insolent to the staff. She would be smiling and cheerful and full of the joy of life, often humming a tune or whistling and look full of vitality as compared with her appearance in the depressed phase. She would be fairly manageable, however, and continued to co-operate with occupational therapy and ward work. It was noticed, too, that in her manic phase she would often walk about with a tumbler of water and take frequent drinks. The staff had remarked that she usually drank fairly large quantities of water in this phase. There was little gross restlessness or excessive motor activity.

In her depressive phase she became quiet, was reluctant to get up in the morning because she felt "rotten". However, she did not as a rule remain in bed and was persuaded to follow her usual routine, although she showed psychomotor retardation and was very dejected. She expressed herself as being fed-up with life and took a gloomy view of everything. On one occasion she made an abortive suicidal attempt by tying a cord round her neck. During her normal phases she would talk quite sensibly and rationally about herself and her plans for the future.

Towards the end of the investigation in July, some E.C.T. was given during a depressed phase. This made but little difference, and E.C.T. was discontinued when, following two weeks of depression, the patient became hypomanic. After the conclusion of the present investigation, the patient was given lithium treatment during manic phases, but this had no effect.

During the collection of specimens careful note was made of the mental state daily, but especially the day before, the day of and the day after the collection of the specimen. A close watch was also kept for the change of phase so that in every instance there should be an accurate correlation between the mental state of the patient and the laboratory findings. In all, four complete cycles were investigated. She proved surprisingly co-operative, even in her psychotic phases.

The patient has continued to have her regular manic and depressive phases since the end of the present investigation. The usual treatments do not seem to have brought permanent relief.

Twenty-four hour urine samples from this case were studied twice weekly for a period of six months, with some interruptions due to home leave or menstruation. The results are shown in Figures 1 and 2. The mental state is indicated by a strip of rectangles above the graphs, a black rectangle signifying a period of depression, a stippled rectangle a manic or hypomanic phase and a white rectangle a period of near-normal mood. The periods of depression and elation coincide fairly closely and regularly with minima and maxima of the total urine volume and of the excretion of sodium, potassium and the three catechol amines. The average of estimations appertaining to the depressive phases was calculated and compared with that related to the manic phases; the difference of the means was found to be highly significant in every case (Table I, Case 1). During the second half of the investigation the excretion of 5-hydroxyindoleacetic acid was also examined; again, an increase was found during the manic phases, but this was not statistically significant.

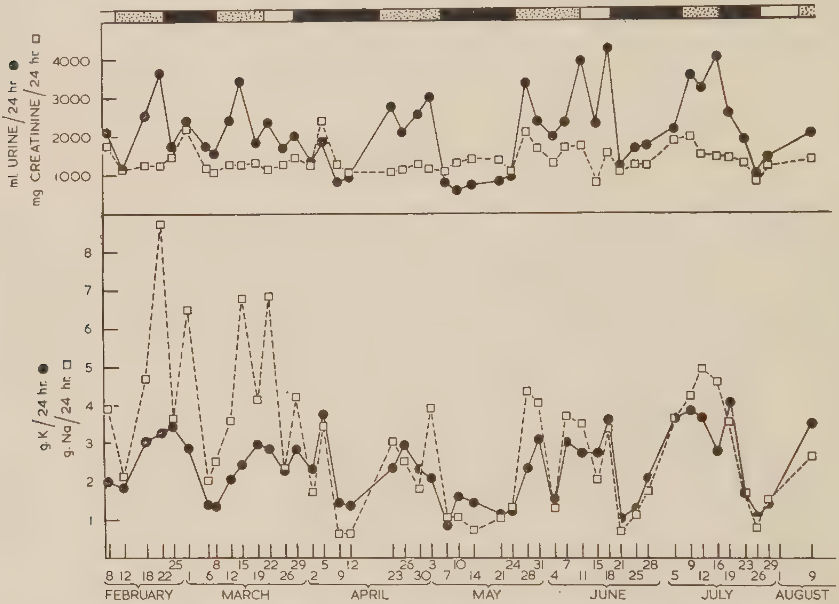


FIG. 1.—Correlation of mental state with urine output and excretion of sodium and potassium in Case 1. The duration of manic phases is shown by stippled bars, that of depressed phases by black bars. Urine volume (●——●) and creatinine excretion (□ – – – □) in upper half, potassium (●——●) and sodium (□ – – – □) excretion in lower half of figure.

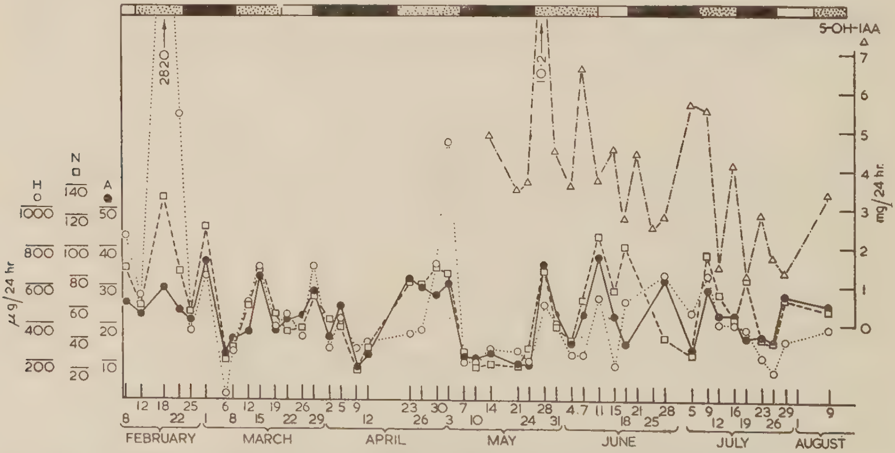


FIG. 2.—Correlation of mental state with excretion of catechol amines and 5-hydroxyindoleacetic acid in Case 1. Manic and depressive phases are shown as in Figure 1.

Adrenaline ●——●
Noradrenaline □ – – – □
3-Hydroxytyramine O · · · · · O
5-Hydroxyindoleacetic acid △ · — · — △

TABLE I

Twenty-four Hour Urine Volumes and Twenty-four Hour Excretion of Urine Constituents in Patients with Manic-Depressive Psychosis. The Values are the Means ± S.E.M.

(Number of estimations in brackets)

Case	Phase	Adrenaline	Noradrenaline	3-Hydroxy-tyramine	Volume	Na	K	5-Hydroxy-indoleacetic Acid
		(µg.)			(ml.)	(g.)		(mg.)
I	Depressed	16·0 ± 1·40 (21)	39·8 ± 3·31 (21)	301 ± 28·3 (21)	1,458 ± 116 (23)	1·97 ± 0·304 (23)	1·94 ± 0·198 (23)	3·18 ± 0·403 (12)
	Manic ..	26·0 ± 1·22 (22)	77·8 ± 4·18 (22)	683 ± 122 (22)	2,766 ± 171 (22)	3·96 ± 0·330 (22)	2·80 ± 0·123 (22)	4·76 ± 0·844 (9)
	P ..	<0·001	<0·001	<0·01	<0·001	<0·001	<0·001	0·1
II	Normal ..	15·4 ± 2·76 (6)	68·9 ± 6·90 (6)	523 ± 59·1 (6)	1,803 ± 138 (6)	2·31 ± 0·355 (6)	1·79 ± 0·310 (6)	—
	Manic ..	25·1 ± 2·19 (7)	106·6 ± 11·78 (7)	668 ± 182 (7)	2,317 ± 217 (7)	3·05 ± 0·263 (7)	2·38 ± 0·215 (7)	—
	P ..	0·02	0·02	N.S.	N.S.	N.S.	N.S.	
III	Depressed	9·1 ± 2·11 (4)	23·7 ± 4·81 (4)	176 ± 45·3 (4)	1,280 ± 316 (5)	2·32 ± 0·20 (5)	1·95 ± 0·306 (5)	2·91 ± 0·166 (5)
	Manic ..	20·4 ± 1·70 (6)	60·9 ± 8·41 (6)	313 ± 39·9 (6)	2,217 ± 246 (6)	2·40 ± 0·307 (6)	2·72 ± 0·22 (6)	4·69 ± 0·49 (6)
	P ..	<0·01	<0·01	N.S.	0·05	N.S.	N.S.	<0·01
Grouped cases	Depressed	9·65 ± 1·10 (12)	27·9 ± 3·70 (12)	324 ± 88 (12)	1,107 ± 74 (12)	1·81 ± 0·146 (12)	1·61 ± 0·13 (12)	—
	Manic ..	19·5 ± 1·84 (12)	93·9 ± 7·94 (12)	423 ± 46 (12)	2,360 ± 252 (12)	1·92 ± 0·372 (12)	2·02 ± 0·246 (12)	—
	P ..	<0·001	<0·001	N.S.	<0·001	N.S.	N.S.	

P = probability value.
N.S. = not significant,

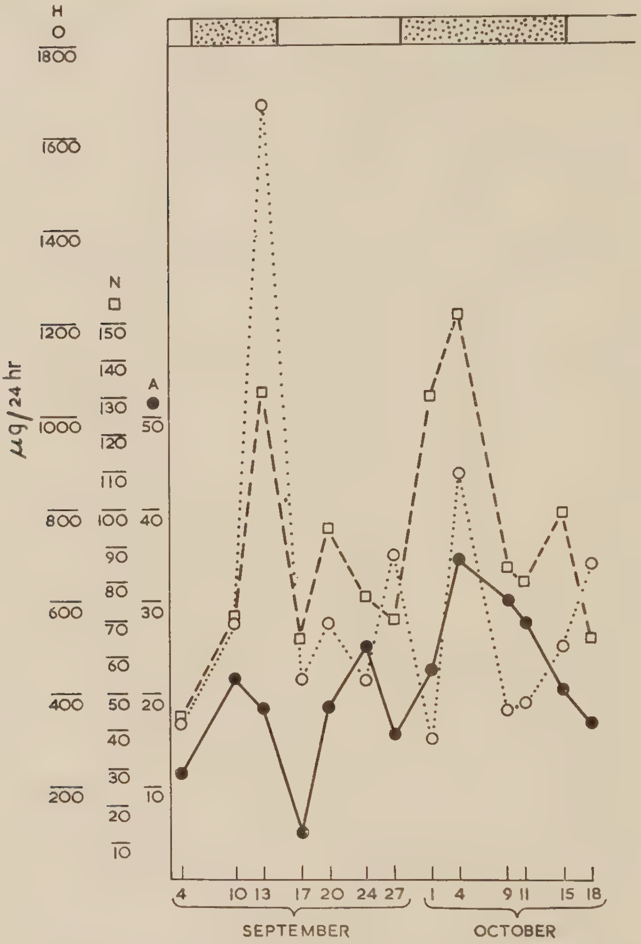


FIG. 3.—Correlation of mental state with excretion of catechol amines in Case 2. Symbols as in Figure 2.

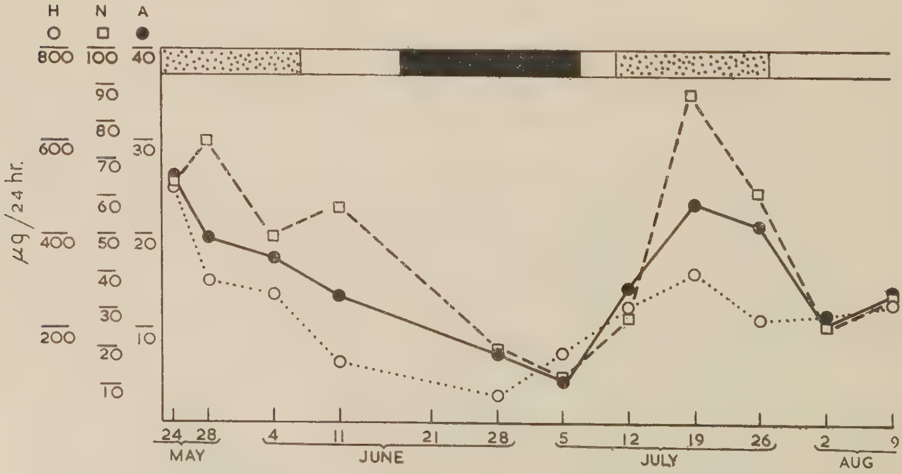


FIG. 4.—Correlation of mental state with excretion of catechol amines in Case 3. Symbols as in Figure 2.

Case 2

A female aged sixty-seven years, married, pyknic build.

A history of manic-depressive psychosis for over twenty years—both manic and depressive phases occurring, but with preponderantly more recurrent manic than depressive attacks.

This patient has been admitted to this hospital with these attacks on twenty different occasions since 1937. The last admission, in August, 1957, was for a depressive phase. This, however, cleared up within six weeks and merged into a typical manic phase. The manic phase continued from the beginning of October, 1957 for a period of eight weeks, after which she was discharged recovered. The present investigation took place during the last two normal and manic phases.

The variations of the urinary excretion of catechol amines and their relation to mood fluctuations is shown in Figure 2. The increase of adrenaline and noradrenaline excretion during the manic phases is significant while that of hydroxytyramine is not (Table I, Case 2). The increases of urine volume and of sodium and potassium excretion were also not significant in this case.

Case 3

A male, aged forty-seven years, with a history of manic-depressive psychosis going back over eleven years.

He is subject mostly to frequent recurrent attacks of acute mania and hypomania but with occasional phases of depression in between. The normal period of remission during the past few years has rarely lasted more than two or three weeks. In his manic attack he is quite typical. He is over-talkative and abusive to staff. At times, he is euphoric and often paranoid and aggressive in his attitude. He shows a marked flight of ideas. Each manic phase usually lasts several months. His depressive attack, however, is usually confined to a few weeks with an almost imperceptible normal phase in between. During his depressed phase he becomes very quiet, unsociable, looks dejected and prefers to stay in bed, if possible. He loses all interest and appears retarded. The present investigation was carried out in both his depressed and manic phases.

Results of catechol amine estimations are shown in Figure 3. In spite of the small number of estimations the increases of adrenaline and noradrenaline excretion during the manic phases are highly significant but, as in Case 2, the excretion of hydroxytyramine was not significantly increased. There was a probably significant increase of the urine volume during the manic phases but no significant change in the excretion of sodium and potassium. On the other hand, the excretion of 5-hydroxyindoleacetic acid was significantly raised during the manic phases (Table I, Case 3).

Grouped Cases

Included in Table I are the means obtained by examining 12 urine samples from 6 cases of depression and 12 urine samples from 5 cases of mania. Case histories have been omitted for the sake of brevity, but only patients where the diagnosis was unequivocal were chosen. Urines from manic patients were significantly larger in volume and contained more adrenaline and noradrenaline than those from depressed patients, but the differences in the excretion of hydroxytyramine, sodium and potassium were not significant.

Several of these patients were also studied serially and, generally, as their symptoms improved, the excretion of catechol amines changed towards more "normal" values.

DISCUSSION

The absence of external causes in the vast majority of cases, together with the suddenness of onset, suggests that the manic-depressive attack is brought on by humoral or metabolic disturbance; according to Bleuler (1930, p. 348) "individual attacks arise largely from within".

The association of manic or depressive psychosis, pyknic habitus and periodicity is still a mystery. In general appearance the manic usually differs from the depressive patient and Bleuler (loc.cit., p. 342) points out that "in euphoria the turgor vitalis is naturally raised; a patient who in a state of melancholia is a broken-up individual may look twenty years younger the next day when he has passed into a manic phase, and then present a vigorous bearing and good appearance". Such a sudden transformation can hardly be explained otherwise than by a change of autonomic or metabolic activity.

The most constant result obtained in our investigation was a higher excretion of adrenaline and noradrenaline in the urine during the manic phase than during the depressed phase. This may have been due to an increased rate of production, to an inhibition of metabolism or utilization or, finally, to a lowering of the kidney "threshold". The most probable assumption seems to be that urinary excretion reflects the rate of discharge but more quantitative data on the excretion of the metabolites of the catechol amines, particularly 3:4-dihydroxy- and 3-methoxy-4-hydroxymandelic acids, are required. Work on this aspect is now in progress at this laboratory.

A correlation between mental stimulation and sympathetic over-activity and between mental retardation and sympathetic inhibition would be in harmony with current concepts. However, depressed patients may exhibit a high degree of apprehension and restlessness; in such cases a high rate of adrenaline discharge would be expected. High levels of blood adrenaline were indeed found in some patients belonging to this category (Weil-Malherbe, 1955b). The depressed patients, with one exception, included in the present study were of the retarded type. If periods of increased adrenaline discharge occur in the depressed phase, they are likely to be less frequent and less sustained than during the manic phase.

A factor which must be considered is the extent of muscular activity, since it is known that increased muscular activity leads to a raised output of adrenaline and noradrenaline in urine (Euler and Hellner, 1952; Euler, Luft and Sundin, 1955). It would of course be interesting to know how much of the increased excretion of catechol amines is secondary to increased muscular activity during the manic phase and how much, if any, is due to midbrain stimulation by other factors. It is impossible to be dogmatic on this point, but it is our impression that muscular activity was not abnormally high during the manic phases nor abnormally low during the depressed phases in the cases here studied. It would of course be desirable to investigate this point with quantitative methods.

The excretion of hydroxytyramine was elevated during the manic phase in our three cases; it was also higher, on the average, in the group of manic than in that of depressed cases, but the difference was only significant in Case 1. The larger fluctuations of hydroxytyramine excretion may be responsible for the lack of significance in the other differences. Very high values, up to 2,000 μg. of hydroxytyramine or more per 24 hours, were occasionally found; some of these urines were investigated by paper chromatographic methods which confirmed the results of the routine analysis. These peaks of hydroxytyramine excretion were sporadic and were not usually observed in subsequent samples —a fact which may be of importance in cases where a phaeochromocytoma is suspected.

Hydroxytyramine is now known to be an intermediary product of the synthesis of adrenaline and noradrenaline from tyrosine. The larger part of tyrosine is not normally converted into adrenaline but metabolized through a different pathway, *via* homogentisic acid. The factors which control the proportions of tyrosine fed into each of these two pathways are unknown, but it may be assumed that the rate of adrenaline discharge regulates the rate of adrenaline synthesis. An increased excretion of hydroxytyramine might therefore be interpreted to indicate a more active synthesis of hydroxytyramine as part of a more active synthesis of adrenaline or noradrenaline. There is however a serious objection to this interpretation: no hydroxytyramine has been detected in venous plasma (Weil-Malherbe and Bone, 1957b). This suggests that most of the hydroxytyramine in urine is formed in the kidney. This organ is not usually associated with adrenaline synthesis and its function in the metabolism of catechol amines remains obscure.

It is probable that the metabolism of serotonin is also increased during manic phases, as suggested by the increased excretion of 5-hydroxyindoleacetic acid. Our determinations of this substance, however, were of a preliminary nature and the results need to be confirmed.

One striking observation which emerged from our study was the increased diuresis during manic phases; this feature was significant except in Case 2. On questioning, most of the patients revealed that they felt thirstier and drank more than usual. This symptom possibly also points to an alteration in the function of hypothalamic centres and hormones. Crammer (1957) described sudden large losses of body weight coinciding with a flare-up of mental symptoms in patients suffering from periodic catatonia and he suggested that losses of body water were responsible. Gjessing (1953), on the other hand, found that diuresis was diminished during the active phase of periodic catatonia.

A significant increase of sodium and potassium excretion during the manic phase was only found in Case 1; in the other groups the symptom was only suggestive. To gauge its significance it would be desirable to maintain the patients on a standardized sodium and potassium intake.

SUMMARY

The urinary twenty-four hour excretion of catechol amines (adrenaline, noradrenaline and 3-hydroxytyramine), of sodium and potassium and, in a limited series, of 5-hydroxyindoleacetic acid has been studied in three patients with periodic attacks of manic-depressive psychosis. In two of the patients manic and depressive phases alternated rhythmically. The cases were studied serially, in one case over a period of six months. Similar, but less extensive studies were carried out on other patients suffering either from mania or depression.

The excretion of adrenaline and noradrenaline was significantly higher during the manic than the depressed phases in all three cases and also in a group consisting of 6 depressed and 5 manic patients. Hydroxytyramine excretion was also increased, but the increase was significant in only one case.

Preliminary results also indicate an increased excretion of 5-hydroxyindoleacetic acid during the manic phase.

A significant increase of sodium and potassium excretion during manic phases was observed in one case.

The twenty-four hour volume of urine was increased during manic phases. The increase was significant, with the exception of one case.

ACKNOWLEDGMENTS

The writers are greatly indebted to the Ward Sisters and the Nursing Staff for their whole-hearted co-operation and to Mr. A. D. Bone, F.I.M.T., and Mrs. N. Stephens for skilled technical assistance. The work was supported by a grant for technical assistance from the Medical Research Council.

REFERENCES

ASHBY, W. R., *J. Ment. Sci.*, 1952, **98**, 81.
BLEULER, E., *Lehrbuch der Psychiatrie*, 1930, 5th ed. Berlin: Springer Verlag.
CRAMMER, J. L., *Lancet*, 1957, *ii*, 259.
DAWSON, J., HULLIN, R. P., and POOL, A., *J. Ment. Sci.*, 1954, **100**, 536.
Iidem, and CROCKET, B. M., *ibid*, 1956, **102**, 168.
EULER, U. S. v., and HELLNER, S., *Acta Physiol. Scand.*, 1952, **26**, 183.
Idem, LUFT, R., and SUNDIN, T., *ibid*, 1955, **34**, 169.
GJESSING, R., *Arch. f. Psychiat.*, 1932, **96**, 319, 393; 1935, **104**, 355; 1939, **109**, 525; 1953, **191**, 191, 220, 247, 297.
GUNNE, L. M., and GEMZELL, C. A., *Acta Psychiat. Neurol. Scand.*, 1956, **31**, 367.
KING, E. J., *Microanalysis in Medical Biochemistry*, 1951. London: J. & A. Churchill Ltd.
MCFARLAND, R. A., and GOLDSTEIN, H., *Amer. J. Psychiat.*, 1939, **13**, 105.

RICHTER, C. P., *Recent Progress in Hormone Research*, 1957, **13,** 105. New York: Academic Press Inc.

ROWNTREE, D. W., and KAY, W. W., *J. Ment. Sci.*, 1952, **98,** 100.

SMITH, S., *J. Nerv. and Ment. Dis.*, 1954, **120,** 245.

TOMASSON, H., *Blodets Elektrolyter og det vegetative Nerve-system, saerlig hos Patienter med Manio-depressiv Psykose*, 1927. Copenhagen: Levin & Munksgaard.

UDENFRIEND, S., TITUS, E., and WEISSBACH, H., *J. Biol. Chem.*, 1955, **216,** 499.

WEIL-MALHERBE, H., *J. Ment. Sci.*, 1955, **101,** 733.

Idem, and BONE, A. D., *J. Clin. Path.*, 1957a, **10,** 138.

Iidem, *Biochem. J.*, 1957b, **67,** 65.

A CONTROLLED STUDY OF THE PROGNOSTIC SIGNIFICANCE OF AUTONOMIC RESPONSES IN THE CHLORPROMAZINE TREATMENT OF DISTURBED PSYCHOTIC PATIENTS

By

N. RATHOD, M.B., B.S., D.P.M.

Senior Registrar
Cane Hill Hospital, Coulsdon

and

LINFORD REES, M.D., M.R.C.P., D.P.M.

Physician
Bethlem Royal and Maudsley Hospitals and St. Bartholomew's Hospital

DESPITE the widespread use of chlorpromazine in psychiatric treatment during recent years and the voluminous literature on its use, there is still considerable difficulty in forecasting which patients are likely to benefit.

While there would appear to be general agreement that certain clinical features, such as psychomotor overactivity, excitement and marked emotional tension, are often susceptible to chlorpromazine therapy, experience shows that in fact only a proportion of patients exhibiting these features derive benefit. It is frequently observed that patients who are closely similar in clinical status and symptomatology may show widely differing therapeutic responses to chlorpromazine, some deriving benefit and others not.

At present there appear to be no reliable clinical criteria for differentiating patients likely to benefit from chlorpromazine therapy from those who will not.

There is clearly a need for further research into the nature of the factors in the individual which determine the therapeutic outcome with chlorpromazine and as a corollary to this, the ascertainment of those individual features or attributes which are prognostically valuable in selecting patients for treatment.

PRESENT INVESTIGATION

The present study, which was started in 1954 at the Bethlem Royal Hospital, was stimulated by the reports of Chauchard *et al.* (1952) that chlorpromazine had marked effects on autonomic functions, exerting both sympatholytic and vagolytic actions, and also by reports on the alleged prognostic value of autonomic responses to mecholyl (amechol) and adrenaline in electroplexy and other forms of physical treatment of psychiatric disorders (Funkenstein, 1949a, 1949b, 1949c, 1950, 1951, 1952).

The objects of the present investigation were:

1. To ascertain the effects of chlorpromazine on the clinical state of a group of disturbed psychotic patients.

2. To observe the autonomic responses to mecholyl and adrenaline before, during and after treatment with chlorpromazine.

3. To determine whether any definite criteria could be established, in terms of autonomic responses to adrenaline or mecholyl, for the use or otherwise of chlorpromazine in disturbed psychotics.

Our preliminary findings (Rees and Rathod, 1956) indicated the need for extending the investigation to a larger group, the results of which are presented in this communication.

Materials and Methods

The patients studied were a group admitted to the ward for disturbed female patients at the Bethlem Royal Hospital.

Patients showing psychomotor overactivity or marked tension or agitation were chosen for treatment, as these were clinical features generally considered to be most suitable for chlorpromazine therapy. The group was a random sample of such patients.

Two main aims were sought for in methodology. One was to ensure a strictly blind controlled procedure of drug administration, and the other was to use standardized, and as far as possible objective criteria for the assessment of clinical state and degree of improvement.

The following procedures were used:

1. Treble blind control, i.e. patient, physician and nurses had no knowledge when active or inert preparation was being administered.

This procedure is, in our view, indispensable for drug trials to obviate bias on the part of observers and to permit the assessment of the possible role of suggestion.

2. Sequence control. As many psychiatric disorders show a tendency to spontaneous recovery or to be influenced by a variety of factors unconnected with the pharmacological effects of a drug under trial, it is essential that these possibilities be controlled. Our method was that half the patients had the active preparation first followed by the inert preparation and the other half of the group the inert followed by the active preparation.

It is also essential to ensure that nursing and medical procedures and the dosage in terms of tablets or injections are the same during the active and inert (control) phases of the trial.

The hospital pharmacist was the only person knowing when active or inert preparations were being given and the allocation and identification of the preparation was by two series of random numbers.

The whole trial was divided into two periods. The first was the double blind trial lasting for 16 days with 8 days on active and 8 days on inert preparation in different sequences as described above.

The second period is referred to as the "continued trial" during which patients received chlorpromazine in varying dosages in an attempt to determine the optimum dose for each patient. This period ranged between four and six weeks after the double blind control period.

Records

The following records were kept:

1. The nurses kept daily notes on the patient's condition.

2. The doctor in charge kept clinical progress notes and also assessed the clinical state of the patient on a psychiatric rating scale. This has 14 items,

each of which can be rated on an eleven point scale. Patients were scored on the psychiatric rating scale before the trial, before and after both inert and active periods and finally at the end of the trial.

SCORING OF THE RESULTS

The course of the patient's clinical state during the investigation was scored in two different ways. One was in terms of the score obtained on the psychiatric rating scale referred to above. The other was to use a 7-point scale based on the overall clinical assessment of the patient's condition. The 7-point scale was as follows:

Symptom-free	+3
Marked improvement	+2
Moderate improvement	+1
No improvement	0
Slightly worse	—1
Moderately worse	—2
Markedly worse	—3

SCORING OF THE RESULTS OF THE AUTONOMIC TEST RESULTS

In each patient the systolic blood pressure was recorded daily for two or three days at 10 a.m. prior to the test and the systolic reading at 10 a.m. on the day of the test was taken as basal blood pressure for the purpose of scoring the responses to the autonomic tests. During the test a score of one point was given to every 10 mm. Hg change in the blood pressure (systolic) as compared with the basal systolic blood pressure. Two examples to make the method clear are given hereunder:

Mrs. H.D. Basal B.P. 110 mm. Hg. Test—I.V. Adrenaline:

Time in Minutes After Injection	B.P.	Score
3	190	8
6	160	5
9	120	1
12	120	1
15	120	1
Total score		16

Mrs. H.M. Basal B.P. 150 mm. Hg. Test—I.V. Amechol:

Time in Minutes After Injection	B.P.	Score
3	140	1
6	140	1
9	175	2
12	140	1
15	150	0
Total score		5

TEST PROCEDURES

Every patient was given an adrenaline sensitivity test. If the adrenaline sensitivity test was negative the patient was given an intravenous adrenaline test, and after that the intramuscular amechol test.

Intravenous Adrenaline Test

Patient was in bed. She was told that she was going to have an intravenous injection as a part of the investigation and treatment, and was told to remain lying down and encouraged to relax. During the next ten seconds an intravenous injection of 0·25 c.c. of 1:10,000 solution of adrenaline hydrochloride was given. After the injection the following were recorded every three minutes for fifteen minutes: Systolic blood pressure, pulse rate, salivation or dryness of the mouth, perspiration of the face or palms, feeling of hot or cold, flushing or pallor of face, and movements of swallowing. In scoring the reactivity of the autonomic nervous system to both the injections of adrenaline and amechol use was made only of the systolic blood pressure responses.

Intramuscular Amechol (Acetyl-β-methylcholine) Test

Three hours or more after the intravenous adrenaline test the amechol test was given. Patient was in bed and was reassured and encouraged to relax as for the intravenous adrenaline test, then 25 mg. amechol were injected by deep intramuscular route in the gluteal region. Then every three minutes for the next fifteen minutes records of the various responses, as mentioned in the intravenous adrenaline test, were made.

Preparation of the Patient

Patients were fully investigated and observed for 10–14 days after admission before allocation to the trial. For 2 to 3 days prior to the trial the following observations were carried out daily: 6-hourly blood pressure readings, pulse and temperature recordings. In most cases the day before, and in some cases two days before the start of the therapy the patients were administered the adrenaline sensitivity test, intravenous adrenaline test and the intramuscular amechol test, and their mental states were recorded on the psychiatric rating scale on the day these tests were carried out. The same test procedures (intravenous adrenaline and intramuscular amechol) and the recording of the mental state on the psychiatric rating scale were repeated on the day prior to the switch-over from one type of preparation to another, and whenever possible at the end of the trial.

Dosage and Route of Administration

The dosage varied from 150 to 250 mg. per day in almost all patients. The drug was administered at 8 a.m., 2 p.m. and 8 p.m. daily. During the first four days of the trial all patients received the drug by deep intramuscular route and for the remainder of the trial the drug was administered orally.

Other Treatment During the Trial

As a rule patients received no other treatment during the trial except the routine ward care available to all patients in the ward. If additional sedation was necessary at night a separate record was kept. This occurred only a few times.

Precautions During the Trial

Nurses were instructed about the possible complications and side effects of chlorpromazine treatment. They were provided with diagrams showing the course of the nerves in the lower extremity and the safe areas for injections.

The following were particularly watched for: signs of irritation and inflammation at site of injection, blood pressure and pulse changes, rise of temperature, jaundice, dermatitis, etc. Blood counts and E.S.R. reading were carried out weekly.

COMPLICATIONS AND SIDE EFFECTS

Leucocytosis up to 10,000 W.B.C. per c.mm. occurred in 4 patients, none of whom showed signs of any physical disease. Leucopenia occurred in 3 patients, the largest fall being from 9,000 W.B.C. per c.mm. to 5,000 W.B.C. per c.mm.

A rise in erythrocyte sedimentation rate without signs of any physical disease occurred in 7 patients. The greatest rise was from 10 mm. to 30 mm. in the first hour, using the Westergren method.

Pyrexia (100° F.) lasting 2 days and without any signs of physical disease occurred in one patient.

Jaundice did not occur in the series.

RESULTS

Table I gives the results obtained during the double blind trial and during the continued trial.

TABLE I

		Double Blind Trial				Continued Trial	
		Inert		Active			
Grade		No.	%	No.	%	No.	%
+3	Total recovery	4	14·8	7	26	10	37
+2	Marked improvement ..	3	11·1	5	18·5	6	22·6
+1	Moderate improvement ..	6	22·2	8	29·6	1	3·7
0	Slight or no improvement	12	44·5	6	22·6	8	29·6
−1	Slight exacerbation ..	1	3·7	1	3·7	1	3·7
−2	Moderate exacerbation ..	1	3·7	0	0	0	0
−3	Marked exacerbation ..	0	0	0	0	1	3·7

It will be observed that 48·1 per cent. show varying degrees of improvement during the period when the inert preparation was given and this strongly emphasizes the need for fully controlled procedures in drug trials on psychiatric patients. The corresponding figure with chlorpromazine is 74·1 per cent., the difference being statistically significant (critical ratio over 2).

Considering only the highest levels of improvement (grades +3 and +2) we find that these occurred in 25·9 per cent. with the inert preparation and 44·5 per cent. with chlorpromazine. This difference approaches statistical significance at the 5 per cent. level and is therefore suggestive but not conclusive.

During the continued trial period 59·6 per cent. showed recovery or marked improvement with chlorpromazine. This proportion is significantly higher than that occurring during the period of administration of the inert preparation (critical ratio being over 2).

The results obtained during continued trial according to diagnostic category were:

Diagnosis	Improved (all grades)	Slight or No Improvement or Worse
Affective disorder:		
Depressive state	6	8
Hypomania or mania	2	0
Schizophrenia:		
Paranoid	6	1
Catatonic	1	1
Simple or hebephrenic	2	0

The improvement was only temporary in 50 per cent., being followed by relapse despite continued medication.

Thus although 74 per cent. improved during the double blind period and 63·3 per cent. during the continued trial, the figure falls to 50 per cent. by the end of 3 months after completion of treatment. The beneficial effects which can be attributed to chlorpromazine are not striking and appear to be mainly symptomatic and often transient.

Autonomic Response to Mecholyl and Adrenaline in Relation to Clinical State During the Trial

Blood pressure responses to mecholyl and adrenaline were rated by the method described (1) before the double blind trial; (2) and (3) at the end of the active and inert periods of administration and (4) at the end of the continued trial, giving four sets of readings for each patient for the experimental period.

Product-moment correlation coefficients were calculated between the scores obtained on the psychiatric rating scale and the scores of blood pressure responses to adrenaline and mecholyl during the period of investigation for the first 18 patients of the series.

The correlation coefficient between score of response to adrenaline and rating scale was +0·24 (standard error 0·15) which was not statistically significant.

The correlation coefficient between scores of blood pressure responses to mecholyl and psychiatric rating scale scores during the period of the investigation was +0·47 (standard error ±0·129) which is statistically significant. This indicates a tendency for amechol scores to be higher when the patient is ill and to fall when clinical improvement takes place.

It is interesting to note that nine out of the fourteen patients who had inert tablets first during the trial showed a reduction in amechol scores, and of these seven improved and two did not improve. Furthermore, of five patients whose scores did not diminish during this period four showed no improvement and only one improved. Thus the correlation between amechol score and changes in clinical state obtains even when the clinical change occurs independently of chlorpromazine therapy.

It was not considered justifiable to correlate amechol response scores with the rating scale score obtained during the inert period when it followed active chlorpromazine, in view of the known influence of chlorpromazine on autonomic responses.

It was also found that reduction in amechol score during active chlorpromazine administration tended to be associated with clinical improvement. The coefficient of colligation between amechol score and clinical response during chlorpromazine therapy was +0·65±·116.

Thus we find a significant correlation between a reduction in amechol score and clinical improvement, whether this occurs during chlorpromazine administration or during the period of administration of inert preparation.

PRE-TREATMENT AMECHOL AND ADRENALINE SCORES IN RELATIONSHIP TO THERAPEUTIC RESULTS

An analysis of variance of the pre-treatment adrenaline and amechol scores of the first 18 patients in the series and therapeutic result classified as:

1. Improved (and not relapsed at 3 months).
2. Improved but relapsed within 3 months.
3. Not improved.

showed that the adrenaline score was not significantly related to outcome but that the response score to amechol had a significant relationship. The level of significance was between 5 per cent. and 1 per cent., F. being 3·94. The investigation was later extended to 27 patients and the significance of the association was confirmed for this group, with a coefficient of colligation of +0·65± ·116 between a pre-treatment amechol score of 3 or more as a prognostic indicator of improvement. An attempt was also made to ascertain whether the amechol scores (*a*) before treatment or (*b*) the manner or degree of change in amechol score with chlorpromazine, differentiated those having lasting improvement from those who relapsed after transient improvement. No statistically significant relationships were found.

Thus the amechol scores in our group were significantly correlated with therapeutic response during the trial, but provided no means of differentiating which patients were likely to have an early relapse from those deriving more prolonged improvement.

DISCUSSION AND CONCLUSIONS

The fact that 48 per cent. of patients showed varying degrees of improvement whilst having the inert preparation indicates the necessity for using fully controlled procedures in therapeutic trials of this kind. The frequency of improvement occurring with active chlorpromazine, however, was statistically significantly greater than that obtained with inert tablets. It may, therefore, be concluded that the clinical improvement occurring with chlorpromazine is attributable, at least in part, to its pharmacological properties. The beneficial results associated with chlorpromazine were not striking and in many instances were not sustained, being followed by an early relapse.

Without the double blind and sequence control procedures it would not have been possible to evaluate the significance of autonomic responses to amechol and adrenaline, in this group of patients.

Our findings show that the changes occurring in blood-pressure response to amechol during the entire trial are significantly correlated with clinical improvement whether this recurs with chlorpromazine or during the control period.

There is now considerable clinical and experimental evidence that autonomic reactivity is correlated with clinical state in psychiatric patients (Gellhorn, 1943, 1953; Henry, 1931; Strongin and Hinsie, 1938).

Funkenstein and co-workers (1948, 1949a, b, c, 1950, 1951, 1957a, b) have carried out pioneer work in the possible prognostic value of blood-pressure responses to adrenaline and mecholyl in physical methods of treatment in psychiatry. Their results were confirmed by Alexander (1955) but not supported by the work of Sloane and Lewis (1956), Sloane, Lewis and Slater (1957).

It should be noted that our procedures differ from those described by Funkenstein in a number of important respects, e.g. in dosage of amechol, with regard to the time interval between blood pressure readings and in the methodage for scoring responses.

The relationships found in our series between pre-treatment amechol response scores and therapeutic outcome merit further investigation and should be tested in other samples of disturbed psychotic patients.

REFERENCES

ALEXANDER, L., *A.M.A. Arch. Neurol. Psychiat.*, 1955, **73,** 496.
CHAUCHARD, B., and CHAUCHARD, P., *Presse Medical*, 1952, **60,** 1674.
FUNKENSTEIN, D. H., GREENBLATT, M., and SOLOMON, H. C., *J. Nerv. Ment. Dis.*, 1948, **108,** 409.
Iidem, ibid., 1949a, **109,** 272.
Iidem, ibid., 1949b, **106,** 16.
Iidem, ibid., 1949c, **106,** 116.
Iidem, ibid., 1950, **106,** 889.
Iidem, ibid., 1951, **114,** 1.
Iidem, Amer. J. Psychiat., 1952a, **108,** 652.
Iidem, Proc. Ass. Res. Nerv. Dis., 1952b, **31**, 245.
GELLHORN, E., *Autonomic Regulations*, 1943. New York: Interscience.
Idem, Physiological Foundations of Neurology and Psychiatry, 1953. Minneapolis: University of Minnesota Press.
HENRY, G. W., *Amer. J. Psychiat.*, 1931, **88,** 119.
REES, L., and LAMBERT, C., *J. Ment. Sci.*, 1955, **101,** 834.
REES, L., and RATHOD, N., *L'Encéphale*, 1956, No. 4, 968.
STRONGIN, E. I., and HINSIE, L. E., *Amer. J. Psychiat.*, 1938, **94,** 1459.
SLOANE, R. B., and LEWIS, D. J., *J. Psychosom. Res.*, 1956, **1,** 233.
Iidem and SLATER, P., *ibid.*, 1957. (In press.)

DISCREPANCIES BETWEEN FACTOR ANALYSIS AND MULTIVARIATE DISCRIMINATION AMONG GROUPS AS APPLIED TO PERSONALITY THEORY

By

LOWELL H. STORMS, B.A., M.S., Ph.D.

Institute of Psychiatry, Maudsley Hospital, University of London

It is clearly advantageous to the personality theorist to know which of his measures covary and to what extent. The results of factor analyses can be useful in summarizing some of the patterns of covariation and classifying response measures. An indefinitely large number of sets of factors may equally well describe the same set of data, however, and, before any choice of one particular set of factors, dimensions, principal components, etc., can be considered as revealing basic intervening variables or constructs in a personality theory, independent evidence must be provided. It is the purpose of this paper to reveal some of the pitfalls in making such a choice by showing how concentration on one set of factors obtained by analysing a multivariate scatter can lead to a serious loss of information when applied to the analysis of group differences in the same set of data and can suggest interpretations which are at odds with the full evidence.

Professor H. J. Eysenck is the most notable example of a personality theorist who makes use of a variety of techniques of multivariate analysis to investigate a set of hypothetical dimensions, so we will compare our results with some of his applications of the same, or similar techniques (2, 3, 4, 5).

The techniques which were employed for the present purposes were factor analysis, discriminant function analysis, and canonical variate analysis. The factor analysis of the same date we used for our calculations is reported by H. J. Eysenck in two articles (2, 4). The data were collected for a Ph.D. thesis by Dr. H. P. Hildebrand (6), who did the original factor analysis, but the analyses to be presented here are additional to those he performed.

METHOD

Subjects

The psychoneurotic Ss, 145 in all, were male voluntary in-patients at Belmont Hospital, Sutton, Surrey. Patients were not included in the sample if they were under 18 or over 50 years of age, showed any evidence of psychotic or neurological disorder, had I.Q.s below 90, or were undergoing E.C.T. or insulin therapy. The patients were diagnosed by psychiatrists with varying points of view, and the diagnosis made by the psychiatrist in charge of a case was not altered by consultation or the pooling of judgments. The sample breakdown by diagnosis is as follows:

Anxiety states	25
Obsessives	10
Depressives	10
Hysterics	25
Psychopaths	20
Mixed neuroses	55

Further details regarding the neurotic sample can be obtained from Hildebrand (6, 7).

The normal group consisted of 22 adult males living in the London area selected by Eysenck and used by him in preference to the normal group used by Hildebrand (5, p. 29). Hildebrand's normals, 25 soldiers from an army re-allocation centre, were not used because they were apparently quite unrepresentative of normal adult males (6, p. 120).

Tests

Hildebrand gave twenty-two tests to all his subjects. The test battery included questionnaires, intelligence tests, and what Eysenck calls "objective behaviour tests". These are described in Hildebrand's thesis (6). For present purposes, a set of six tests and one of ten were selected from the twenty-two. These are listed below with the abbreviations which we shall use throughout.

Set 1

± Maudsley Medical Questionnaire (MMQ)
+ Guilford R Scale (R)
± MMQ Lie Scale (L.S.)
± Annoyance Test (Ann.)
± Guilford S Scale (S)
± Guilford T Scale (T)
± Summed Guilford D and C Scales (D±C)
+ Porteus Mazes Weighted Wrong Directions (WWD)
+ Porteus Mazes Crossed Lines (X line)
Mill Hill Vocabulary (MHV)

Set 2

? Maudsley Medical Questionnaire
Guilford R Scale
MMQ Lie Scale
Annoyance Test
Suggestibility Reversals (Rev.)
Leg Persistence (L.P.)

The six tests marked ± were chosen for Set 1 because they had the highest loadings on Hildebrand's neuroticism dimension; the three marked + were chosen because they had the highest loadings on his introversion-extraversion factor; the remaining test was chosen in order to provide a check on the effects of intelligence. Five of the tests in Set 2 were chosen because they were the only tests among the 22 which yielded F tests significant at the 5 per cent. level (or better) for discrimination among the six neurotic groups after transformations had corrected for heterogeneity of variance. The sixth, marked with a ?, was chosen as a possible contributor to the discriminant functions and because it was desired to have as many tests as groups.

Thus, Set 1 was selected to represent the main factors of the Hildebrand analysis, while Set 2 was picked according to the empirically observed discriminations yielded by the single tests. As a result, we have two groups of tests which can be compared for combined power of discrimination between pairs of neurotic groups.

The analyses for Set 1 were performed using all the Ss (N=167); the analyses for Set 2 were done using only the six neurotic groups (N=145), since these were the only groups to whom all six tests of this set were administered.

The Analyses

Three kinds of multivariate analysis were applied to the data for each set of tests. They are as follows:

1. Discriminant functions comparing each group with every other group. A convenient account of the method is given in Rao (10, p. 246–252). Twenty-one such comparisons were performed for Set 1 (seven groups of Ss) and fifteen for Set 2 (six groups). All discriminations were tested for significance using the analysis of variance technique described by K. S. Mather (8, p. 156). The percentage of total variance accounted for by the difference between means for each pair of groups was also computed.

2. The Hotelling principal components method, which can be found in Thompson (11, p. 108–126), was used to analyse the matrix of within groups variances and covariances for both sets of tests. This method is a form of factor analysis and uses units rather than estimated communalities in the diagonal of the correlation matrix.

3. A canonical variate analysis (10, p. 365–370), essentially a principal component analysis of the multivariate dispersion between groups, was performed on both matrices.

Our interest will centre primarily upon the comparative power of the two sets of tests as reflected in the discriminant functions and upon the relationship between the principal components and the canonical variates obtained for each set of data. This relationship constitutes a comparison of dimensions resulting from analysing within group and between group matrices (indeed, the principal components method was employed because of its comparability with canonical variate analysis).

These comparisons, and other aspects of the analysis, will be discussed and related to Eysenck's use of these methods.

Table I

Discriminant Function Significance Tests and Percentages of Variance Accounted for by Group Differences

Pairs of Groups	Set 1		Set 2	
	F Tests	Per cent. Variance	F Tests	Per cent. Variance
Anxiety—Obsessive	1·160	7·18	1·588	6·69
Anxiety—Depressive	1·024	6·39	0·708	3·09
Anxiety—Hysteric	2·275*	13·17	5·153†	18·86
Anxiety—Psychopath	2·883†	16·12	4·218†	15·99
Anxiety—Mixed	1·145	7·09	1·570	6·33
Anxiety—Normal	7·731†	34·01		
Obsessive—Depressive	1·226	7·56	1·089	4·68
Obsessive—Hysteric	1·806	10·75	2·501*	10·14
Obsessive—Psychopath	1·154	7·14	2·076	8·56
Obsessive—Mixed	0·784	4·97	1·077	4·63
Obsessive—Normal	3·824†	20·32		
Depressive—Hysteric	0·819	5·18	2·922*	11·65
Depressive—Psychopath	2·904†	16·22	3·610†	14·01
Depressive—Mixed	1·249	7·69	0·892	3·87
Depressive—Normal	3·834†	20·36		
Hysteric—Psychopath	2·259†	13·09	5·665†	20·35
Hysteric—Mixed	1·179	7·28	4·479†	16·81
Hysteric—Normal	5·947†	28·39		
Psychopath—Mixed	2·451†	14·05	2·932*	11·68
Psychopath—Normal	7·316†	32·79		
Mixed—Normal	0·103	0·68		

* Significant at 5 per cent. level. † Significant at 1 per cent. level.

TABLE II

Loadings of the Tests on the Canonical Variates (L) and Latent Roots (l)*

	Set 1						Set 2				
	L_1	L_2	L_3	l_1	l_2	l_3	L_1	L_2	l_1	l_2	l_3
1. MHV ..	·2658	·7398	·1916	·0780	·5727	1·0000					
2. MMQ ..	1·0000	·4204	·8087	·9124	·0027	—·4127	·0848	—·2664	1·0000	+·0017	—·1065
3. Lie scales	·1080	—·9173	·5732	—·4988	—·1657	—·4904	·6220	—·5970	—·6921	—·3970	—·7406
4. Ann. ..	—·3145	·9261	·4815	·7179	·0398	—·4041	·2727	+·8454	·8713	—·0100	—·3826
5. S	—·3845	—·4425	—·4801	·8675	—·3773	·0461					
6. T	·0625	·4506	·0005	·8127	—·1044	·4885					
7. D+C ..	·3222	·1273	—·8747	1·0000	·1495	—·1718					
8. R	·0321	1·0000	·3892	—·3954	·8218	—·1691	·5270	+1·0000	1·4827	·1404	+·5627
9. WWD ..	·1074	·5510	—·2264	·2332	1·0000	·1391					
10. X lines ..	—·1608	—·4441	1·0000	·2101	·9334	·6456					
11. L.P. ..							·8543	+·1886	·2150	—·6102	+1·0000
12. Rev. ..							1·0000	—·1153	—·0688	1·0000	+·2336

* For maximal comparability, all latent vectors have been scaled so that the highest loading equals unity.

RESULTS

The F ratios showing how well pairs of groups are differentiated using discriminant function weights are presented in Table I on page 715, along with percentages of variance accounted for by differences between means of weighted scores.

Although the two sets of tests have four tests in common, it can be seen that among the neurotic groups (the only basis for comparison since the normal group was not used in the analysis for Set 2) the set with only two additional tests selected empirically yielded eight out of a possible fifteen significant discriminations, while the set with six additional tests selected to represent factors, yielded five. The percentages of variance accounted for by group differences are very slightly higher for Set 1, but where significant differences were found, Set 2, the shorter test battery, has a higher percentage in half the cases. (As in the case of multiple correlations, the addition of useless predictors almost always increases the percentage of variance accounted for and may at the same time reduce the statistical significance.)

From the Set 1 data, 4 significant principal components and 2 significant canonical variates were extracted. Set 2 matrices produced 4 significant principal components and 2 significant canonical variates. The significance test for principal component residuals is given by Bartlett (1), and the test for the canonical variates by Rao and Slater (9, p. 25).

It can be seen in Table II that the loadings on the common tests for the two sets of principal components and the two sets of canonical variates do not closely resemble one another, except that the first principal components are quite similar. This illustrates the differences that can arise from the use of different groups and different test batteries, but in the present case the portions of the effect due to tests and to samples cannot be separated.

A better comparison can be made between the principal components and the canonical variates obtained using the same Ss and the same tests. The patterns of loadings in Table II are seen to be different for the principal components as compared with the canonical variates for both sets of tests. For example, the L_1 loadings rank correlate ·19 with l_1's for Set 1. The most legitimate comparisons that can be made, however, are the correlations between the subject's factor scores and canonical variate scores obtained by weighting test scores by the proper loadings. These correlations are presented in Table III.

TABLE III

Intercorrelations Between Principal Component Factor Scores and Canonical Variate Scores

Canonical Variates	Principal Components 11	12	13	14
L_1	·544	−·005	−·153	·016
L_2	·193	·374	·280	−·680
L_3	−·271	·553	−·157	−·050
L_4	−·073	−·620	·187	−·167

It is apparent that no correlation is high enough for the two dimensions involved to be considered identical. It is also evident that the dimensions which correlate most strongly are not necessarily the ones which came out in the same stages of the analysis. Thus, for example, the first canonical variate and the first principal component correlate less highly than the second canonical variate and the fourth principal component. This indicates that in the present data the major dimensions describing the within groups scatter are not the same as those describing differences between groups. Even for the dimensions which correlate most strongly, the patterns of test loadings are widely divergent, as can be seen in Table II.

Discussion

The major conclusions of the present analysis are those drawn from the discriminant functions and from the comparison of principal components with canonical variates.

1. Selection of tests according to their loadings on supposedly relevant factors for the purpose of discriminating groups may yield results inferior to those which can be obtained from tests which are selected so as to provide as much information as possible. A shorter test battery selected on practical grounds may be more efficient than a long one with supposed dimensional relevance. Other influences than those represented by the factors may be entirely overlooked using the latter approach. This seems to have been what happened with the Eysenckian dimensions used in this analysis.

Because discriminant function analysis and multiple regression are analogous, it is apposite to mention that Watts and Slater found similar discrepancies between the results of factor analysis and multiple regression (12, p. 48–59).

2. The primary dimensions of covariation within groups may not be the same as the primary dimensions of between groups covariation. Indeed, there is no mathematical reason to expect that they will be, though theoretical considerations regarding the phenomena involved might lead to an expectation of such a correspondence. Eysenck seems to have propounded some such hypotheses about his dimensions. He found it necessary to rotate his canonical variates to make them consistent with his dimensions of neuroticism and psychoticism (3). He writes, "The original variates, Y_1 and Y_2, cannot be interpreted as corresponding to these factors as their position is not invariant". There is nothing to indicate that his new variates, Z_1 and Z_2, are any more invariant; at least Y_1 and Y_2, are invariant in the particular sample under consideration. Rotated canonical variates are no longer canonical variates because they no longer describe the major dimensions of the between groups multivariate scatter (strongly implying that they were orthogonal, he also did not point out that his rotated variates were correlated in his sample). Thus, Eysenck's findings seem to support our conclusion that within groups and between groups dispersions may yield different major dimensions.

From a practical standpoint, it is advantageous if the within groups and between groups dispersions lie along different dimensions. The two dimensional illustration in Figure 1 shows that, other things being equal, different major dimensions of within groups and between groups dispersion may allow more accurate discrimination of the groups than is the case when they are the same.

Although Eysenck will not find anything inconsistent in the finding of several principal components in each analysis, since he does not claim that his psychoticism, neuroticism, and extraversion-introversion dimensions cover the whole range of human variation, the emergence of three significant canonical variates from the analysis for Set 1 and two from the analysis of the Set 2 data poses a problem for him. He has tried to justify the use of the hysteric-

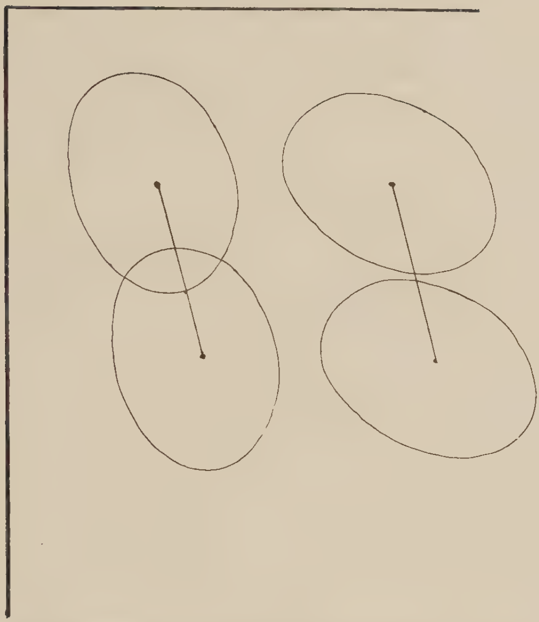


FIG. 1.—Comparison of between and within groups dispersions according to whether they have same or different major dimensions.

psychopath and dysthymic groups as criteria for extraversion and introversion, respectively (4, p. 22). Also, in his new book (5, p. 26) he makes this statement: "There is considerable evidence, which has been reviewed in great detail in *The Structure of Human Personality* (Eysenck, 1953), that the traditional psychiatric syndromes in the field of neurosis are generated by two factors, continua, or dimensions; namely, those of neuroticism and of extraversion-introversion." Discussing Hildebrand's results, he goes on to say that neurotic groups should be differentiated from normals on neuroticism and from each other in terms of extraversion-introversion (I–E). Although he further states: "It is not suggested that the three dimensions of psychoticism, neuroticism and extraversion-introversion . . . are the only ones which play a part in abnormal behaviour; it is highly probable that further research will succeed in unearthing other major dimensions", he implies that the important differences among neurotic groups are accounted for by different degrees of extraversion (5, p. 30). Our analyses make it clear that "other major dimensions" were implicit in the Hildebrand data all the time. The present results suggest not only that the major differences between neurotic groups lie on a "dimension" different from I-E, but also that there are more sources of between-group differences than Eysenck has indicated. These results were found using data from tests the selection of which Hildebrand describes thus: "Two groups of tests were chosen, one of which had been shown by previous work to differentiate between normal and neurotic groups and the other which previous work suggested having some loading on the I-E factors" (6, p. 18).

Hildebrand computed factor scores for his groups and found that hysterics and anxiety states were significantly differentiated (5 per cent. level). Eysenck takes this as support for his theory (4, 5), which seems justified as far as it goes. However, the fuller analysis reported here shows that the two groups are more efficiently discriminated by the six tests in Set 2, and the dimension defined by the discriminant function weights bears little resemblance to introversion-extraversion (also, two tests, suggestibility reversals, which Hildebrand found to have a negligible loading on I-E, and Guilford's R scale, which had the highest I-E loading, were each found to differentiate the same two groups at the 1 per cent. level—reasonably enough, these two tests had the highest discriminant function weights). It appears that the data contain more relevant information than that summarized by the factor loadings.

A finding that Eysenck may find difficult to reconcile with his theory or with his practice of combining the hysteric and psychopathic groups (4, 5) to form a criterion group for extraversion is that psychopaths and hysterics were the two groups most significantly discriminated using both sets of tests. This is not surprising in view of the previously unreported fact that three of the tests used significantly discriminated hysterics and psychopaths ($p < \cdot 01$ in each case). These tests are suggestibility reversals, MPI lie scale, and leg persistence. All three are included in Set 2, only the lie scale in Set 1, so it was to be expected that Set 2 would discriminate the groups more significantly than Set 1. It should be noted that this discrimination also occurred using the same tests (those of Set 1) which are supposed to define the neuroticism and I-E dimensions. The groups in question differ either on these dimensions alone or on some other combination of characteristics. Eysenck has reported studies using these two groups pooled in varying proportions and calling them neurotic extraverts. This would be defensible if the groups differed only on extraversion, which is not the case. If they differ on neuroticism or other characteristics, such differences will enter into the differences between the pooled group and other groups in varying degrees from one experiment to another. Furthermore, the differences between the hysteric and psychopath groups may reflect dimensions or phenomena which have been overlooked and are worthy of study.

SUMMARY

To illustrate some of the problems arising from attempts to relate results of factor analyses to differences among groups, discriminant functions, principal component analyses, and canonical variate analyses were performed using the data from two sets of tests which were administered to six neurotic groups and a normal group (the tests had been included in a larger test battery). One set consisted of ten tests selected primarily on the basis of high factor loadings on neuroticism and introversion:extraversion factors computed with the same subjects and the larger battery of tests. The other set consisted of six tests selected primarily because they gave the largest F ratios for differences among neurotic groups. Four of the tests were common to the two sets.

It was found that the smaller set of tests yielded more significant discriminations than the larger in the discriminant function analysis. Principal component analyses of the within groups variances and covariances resulted in a similar first "dimension" in each set of tests, but the other dimensions were not alike. An important discrepancy found in this analysis was that for neither set of tests did the major dimensions of the within groups scatter (principal components) correspond with the major dimensions of the between groups dispersion (canonical variates).

The results seem to indicate that adherence to dimensions derived from factor analyses when analysing differences among groups can lead to a serious loss of information and may lead to inefficiency in practical applications or over-simplification in theoretical interpretations. It was shown that dimensions describing between groups differences need not be the same as those appearing within groups and that it is better for purposes of discriminating groups if they are not.

On the basis of the results of our analysis, Eysenck's interpretation of a canonical variate analysis which he performed and his pooling of hysterics and psychopaths to form criterion groups for the study of extraversion were called into question.

ACKNOWLEDGMENTS

The author expresses his gratitude to Mr. Patrick Slater for helpful suggestions and a critical reading of the manuscript and to Professor Eysenck for generously providing access to his data on the normal group and to the facilities of the Psychology Department at Maudsley Hospital.

References

1. Bartlett, M. S., "Tests of significance in factor analysis", *Brit. J. Psychol. Stats. Sec.*, 1950, **3,** 77–85.
2. Eysenck, H. J., "Cortical inhibition, figural after-effect, and theory of personality", *J. abnorm. soc. Psychol.*, 1955, **51,** 94–106.
3. *Idem*, "Psychiatric diagnosis as a psychological and statistical problem", *Psychol. Rep.*, 1955, **1,** 3–17.
4. *Idem*, "A dynamic theory of anxiety and hysteria", *J. Ment. Sci.*, 1955, **101,** 28–51.
5. *Idem*, *The Dynamics of Anxiety and Hysteria*, 1957. London: Routledge and Kegan Paul.
6. Hildebrand, H. P., "A factorial study of introversion-extraversion by means of objective tests", 1953. Ph.D. Thesis, Univ. of London.
7. *Idem*, "A factorial study of introversion-extraversion", *Brit. J. Psychol.* In press.
8. Mather, K. S., *Statistical Analysis in Biology*, 1946. London: Methuen and Co.
9. Rao, C. R., and Slater, P., "Multivariate analysis applied to differences among neurotic groups", *Brit. J. Psychol., Stat. Sec.*, 1949, **2,** 17–29.
10. *Idem*, *Advanced Statistical Methods in Biometric Research*, 1952. New York: John Wiley and Sons.
11. Thompson, G. H., *The Factorial Analysis of Human Ability*, 1951. London: Univ. of London Press.
12. Watts, A. F., and Slater, P., *The Allocation of Primary School Leavers to Courses of Secondary Education*, 1950. London: Newnes Educational Publishing Co.

PSYCHONEUROTIC SYMPTOM CLUSTERS, TRAIT CLUSTERS AND PSYCHOLOGICAL TESTS

By

G. A. FOULDS, M.A., Ph.D.

and

T. M. CAINE, M.A.

Psychology Department, Runwell Hospital, Wickford, Essex

INTRODUCTION

PSYCHIATRISTS and clinical psychologists can be classified into the Big-Endians who believe in classification and the Little-Endians who do not. Each side has its derogatory stereotype of the other. According to the Little-Endians, Big-Endians are tough-minded, cold, impersonal monsters who think about the human personality in terms which are static and rigidly structural rather than fluid and dynamic. Contrary to Swift, they love people in general and hate Tom, Dick and Harry. In the field of mental health, they believe in illnesses rather than in people and believe that these illnesses all have an as yet unknown physical cause. They are reactionaries.

Some Big-Endians believe that this stereotype arose in part from certain unfortunate historical associations. The most famous classificatory system in psychiatry, that of Kraepelin, was formulated at a time when the layman thought of matter as being made up of discrete particles, of mind as being made up of discrete faculties and of mental illness as an entity dissociable from the person suffering from it. Acceptance of the need for classification in science does not of necessity imply ignorance of Heisenberg's *Principle of Uncertainty* or of Whitehead's *Process and Reality*. The classification and description of symptom clusters by the modern method of factor analysis may bear a close resemblance to the Kraepelinian system without entailing acceptance of all Kraepelin's opinions on the nature of symptoms. The view that the factors of the mind may be ordering concepts derived from operations carried out for the convenience of the observer rather than necessarily existent in the observed can well be applied to the classification of those who are mentally ill. This radical change in attitude appears to have passed unnoticed among the Little-Endians. Until it has been recognized future debates are likely to continue to be as heated and profitless as heretofore.

The contention is then that some investigators at least should endeavour to discover what progress can be made within the established descriptive classificatory system or modifications thereof. The present modification which was proposed in a previous study (Foulds, 1955), though implicit in many authoritative psychiatric texts, does not appear to have been used as a basis for systematic investigation.

Curran and Guttmann (1949) state that "true obsessive-compulsive states may develop in personalities with little or no evidence of obsessional characteristics in their previous make-up", whilst Lewis and Mapother (1941) claim that "the hysterical personality . . . is not found in all patients who show hysterical symptoms, but nearly all people of hysterical personality show hysterical symptoms". A distinction is clearly being made between symptom clusters (or syndromes) and trait clusters (or personality types).

The characteristic pre-morbid personality traits of obsessional and hysterical patients as described by Lewis and Mapother (1941) have formed the basis of a rating scale which has served to divide the psychoneurotic subjects of this study into two groups. The relevant passages are as follows: "Very many obsessional patients have for years before they became ill shown a rather characteristic mental constitution; they are extremely cleanly, orderly and conscientious, sticklers for precision; they have inconclusive ways of thinking and acting; they are given to needless repetition. Those who have shown such traits since childhood are often morose, obstinate, irritable people; others are vacillating, uncertain of themselves, and submissive". Lewis and Mapother (1941) use the following descriptive terms for the hysterical personality: "they are over-active, unsatisfied with their own capacities and, therefore, pose and pretend; they show lability of affect and exuberance of fancy, egotism, untruthfulness, longing for prestige, sympathy and love; they use illness to satisfy these needs; they show heightened suggestibility, hypomnesia is common; it occurs more frequently in women who may be both coquettish and frigid".

The subjects of this study have been further split on the basis of their clinical diagnosis into Dysthymics (Anxiety States and psychoneurotic depressives) and Hysterics. Patients could, therefore, be classified as Hysterics with a hysteroid personality; Hysterics with an obsessive personality; Dysthymics with a hysteroid personality and Dysthymics with an obsessive personality.

Given this classification, it becomes possible to determine whether various psychological test measurements are related to symptom clusters or to personality trait clusters. If all the test measurements relate to diagnosis or to personality type, the unrelated variable could be ignored subsequently; if, however, some measures relate to diagnosis and some to personality type, the value of the classification for clinical psychologists would have been demonstrated. The likelihood that it would be useful for psychiatrists would have been increased, but not proven.

Psychiatrists are frequently concerned to know what heuristic value there is in demonstrating agreement between psychological tests and such a dubious outside criterion as psychiatric diagnosis. If a close agreement can be demonstrated, this suggests that the classifications which psychiatrists make are in fact predictive of the behaviour of members of each class in certain standard test situations. This is an indication that the rather subjective processes through which psychiatrists have perforce to go in order to arrive at a diagnosis are not entirely dereistic. It suggests further that the behaviour of particular individuals in certain standard test situations is predictive of the way in which psychiatrists will classify these particular individuals. The results are, therefore, mutually supportive. For this psychiatrists should be grateful rather than querulous. If exceedingly close agreement can be demonstrated, this suggests that, for classificatory purposes *per se*, it does not matter which system is used. If one system happens to be objective and quantitative that system is to be preferred, since correlation with other as yet unrelated variables is facilitated. It is not suggested that this goal has been reached, but its desirability is beyond reasonable doubt.

In addition to confirming or disconfirming the psychiatric diagnosis the psychological tests do of course provide a reasonable amount of other potentially useful information. From the present battery, for example, the psychiatrist may learn something of the patient's concept of herself in relation to others, something of the extent and direction of her hostile impulses, something of her speed and fluency of mental functioning, something of the nature of the symptoms of which she herself complains, something of the extent to which pre-occupation with these symptoms interferes with attention to other concerns and, incidentally, something of the patient's generally acquired information, general intellectual capacity and idiosyncratic problems over inter-personal relationships. If, say, the Hysteric's manner of functioning in each of these areas were totally at odds with what would, from many decades of experience of many psychiatrists, be expected of an Hysteric, the results would naturally need to be treated with considerable caution.

Subjects and Their Classification

For fourteen months all women (aged 20 to 59) admitted to the hospital and diagnosed as psychoneurotic were included in the study. For the next three months only Dysthymics of obsessive personality under 40 years of age and Dysthymics and Hysterics of hysteroid personality over 40 years of age were tested to ensure matching for age. This necessitated rejecting only 4 out of 72 successive admissions. Distortion of the sample was, therefore, minimal and it may be regarded as reasonably representative of psychoneurotic women admitted to this hospital.

For the diagnostic classification the psychiatric diagnosis—uncontaminated by test results—which was entered in the official records was accepted. For the personality classification two psychiatrists independently rated the pre-morbid personality of subjects on the five-point Hysteroid-Obsessive Rating Scale.

The items of the scale were as follows:

1. *Excessive display of emotions* to Scarcely any display of emotions
2. Complete inability to indulge in fanciful thinking to *Vivid daydreams which come to be half believed*
3. *Very frequent mood changes* to Mood tends to remain extremely constant
4. Often seems to be conscience-stricken to *Seems to be completely lacking in conscience*
5. Slow and undecided owing to weighing of pros and cons to *Given to precipitate action*
6. Obstinately independent to *Childishly over-dependent*
7. *Careless and inaccurate* to Stickler for precision
8. *Emotions appear shallow* to Appears to feel things too deeply
9. *Extreme desire to impress and gain attention* to Extremely self-effacing
10. This patient arouses my sympathy to This patient arouses my hostility

Italicized items are scored +2 (hysteroid) through to −2 (obsessive). Item 10 is not included in the hysteroid:obsessive score.

Re-rating reliability correlation after an average interval of one month was ·65. In 12 per cent. of the cases the rating of one or other psychiatrist changed from the hysteroid to the obsessive side or conversely. The inter-psychiatrist correlation was ·67. In 14 per cent. of the cases on the initial rating, on which the classification was based, the two psychiatrists failed to agree on the category. A third rater was then used. The resulting distribution of the 68 cases was: 16 Hysterics of hysteroid personality (Hh); 4 Hysterics of obsessive personality (Ho); 26 Dysthymics of hysteroid personality (Dh) and 22 Dysthymics of obsessive personality (Do).

THE TESTS

The tests used were the Mill Hill Vocabulary Scale, the Progressive Matrices (1938), the Porteus Mazes, the Thematic Apperception Test, the Minnesota Multiphasic Personality Inventory, the Superiority-Inferiority Index and the Tapping Test.

The Progressive Matrices was given without a time limit; but the time taken for each set was recorded with the patient's knowledge.

The Porteus Maze administration was as previously reported (Foulds, 1951, 1952). On this occasion scoring categories were limited to total time taken (T.T.); number of wrong directions (W.D.); number of lifted pencils (L.P.); number of crossed lines (C.L.) and the time taken on second performance, when the subject had to repeat numbers after the tester, as a percentage of the first performance (distraction effect).

The Thematic Apperception Test was administered as previously reported (Foulds, 1953) and on this occasion the scoring categories were: Mean number of words per picture; Fluency (i.e. number of words spoken per minute); and expressed Hostility as rated by three judges.

The Superiority-Inferiority Index was administered and scored as previously reported (Foulds, 1958)*. A positive score indicates that the subject thinks she comes nearer to her conception of ideal conduct than most people, that is she feels relatively superior; conversely, a negative score indicates that she feels relatively inferior.

In the Tapping Test subjects were asked to tap with a pencil as quickly as possible for 10 seconds. A transparent sheet marked off into 320 half-inch squares was placed over the protocol and the number of squares containing dots was counted, the scatter score being the average of three trials.

The Mill Hill Vocabulary scale and the Minnesota Multiphasic Personality Inventory were administered in the standard way.

Since the majority of measures gave markedly skewed distributions, it was thought that clarity and ease of comparison would best be served by using throughout the Mann Whitney U for $n_2 > 20$ (2 tail), where

$$U = n_1 n_2 + \frac{n_1 (n_1 + 1)}{2} - R_1 \quad (R_1 \text{ being } \Sigma \text{ ranks of } n_1)$$

and

$$Z = \frac{U - \frac{n_1 n_2}{2}}{\sqrt{\frac{(n_1)(n_2)(n_1 + n_2 + 1)}{12}}}$$

The Ho group was too small to be useful, so the study was confined to 16 Hh; 26 Dh and 22 Do.

---

* The subject is presented with twenty-four situations in which a person has made a provocative remark to which four possible answers are supplied. Two of these blame the provoker (extrapunitive) and two the provoked (intropunitive). For each situation the subject has first to select the answer she thinks she would make (S), then the answer she thinks ought to be made (O) and, finally, the answer she thinks most people would make (M). The Superiority-Inferiority Index is (Oe-Me)—(Oe-Se) i.e. the difference, regardless of direction, between the number of extrapunitive responses that the subject thinks she would and ought to make subtracted from the difference, again regardless of direction, between the number of extrapunitive responses that the subject thinks most people would and ought to make.

RESULTS

Table I shows the differences between each pair of groups for all measures. Clearly the differences tend to fall into three rather distinct groups: those which are not significant anywhere; those which are significant, or nearly so, as between diagnostic, but not personality groups and those which are significant between personality but not diagnostic groupings. The median scores for the latter two groups are shown in Table II.

TABLE I

Mann Whitney U for $n_2>20$ *(2 Tail)*

	Hh and Dh		Hh and Do		Do and Dh	
	Z	p	Z	p	Z	p
Maze distraction %	*2·19*	*·0286*	*1·91*	*·0562*	·07	·9442
MMPI: D-Hs	*2·10*	*·0358*	*1·94*	*·0524*	·29	·7718
TAT: Total words	*2·32*	*·0204*	*1·85*	*·0644*	·53	·5962
Tapping	*2·09*	*·0366*	U=72	$\alpha=>\cdot 10$	1·12	·2628
Maze: L.P.	·27	·7872	*2·74*	*·0062*	*3·03*	*·0024*
Maze: T.T.	·92	·3576	*2·16*	*·0308*	*2·24*	*·0250*
P.M. time	·18	·8572	*1·91*	*·0562*	*2·57*	*·0102*
Superiority index	·75	·4532	*2·51*	*·0120*	1·55	·1212
MMPI: Hostility	·87	·3844	*2·56*	*·0104*	1·58	·1142
MMPI: Hy+Pd+Pt+Sc	1·10	·2714	1·42	·1556	*2·58*	*·0098*
Maze: C.L.	·30	·7642	·94	·3472	1·13	·2584
Maze: W.D.	·61	·5418	1·20	·2302	*1·86*	*·0628*
TAT: Wpm	·63	·5286	·07	·9442	·66	·5092
TAT: St.T.	·45	·6528	1·57	·1164	·68	·4966
P.M. score	1·58	·1142	·17	·8650	1·56	·1188
M.H.V. score	·23	·8180	·89	·3734	1·08	·2802
Age	·51	·6100	·64	·5222	1·41	·1586

TABLE II

Median Scores on Measures Showing Significant Differences Between Either Diagnostic or Personality Types

	Hh	Dh	Do
Maze: distraction percentage	77	66	68
Tapping: number of squares entered	26	4	5
TAT: mean words per story	101	78	84
M.M.P.I.: D–Hs scales	5	12	13
Maze: total time in seconds	250	274	368
Maze: lifted pencils	8	7	16
Progressive matrices: time in minutes	33	36	56
M.M.P.I.: hostility scale	9	9	6
Superiority-Inferiority index	3	1	−1
M.M.P.I.: Pd+Hy+Pt+Sc scales	273	290	258

Tests Showing No Differences

The groups were roughly equated for age in the first instance. Progressive Matrices and Mill Hill Vocabulary scores would have been equated had they not chanced to be so. There was no difference between groups on the Matrices: Vocabulary grade ratio. Previous results (Foulds, 1956) were thus not confirmed. The earlier study used diagnostic classes only and the administration was different in the two studies. In the present study the examiner was seated by the patient and the time taken to complete each set was noted with the patient's knowledge of the result. In the former study the examiner was seated behind the subject and proceeded with other work, allowing the test to be completed in the patient's own time without interruption. The pressure on the patient to work fast was, therefore, much less. The findings of Himmelweit (1946) indicate that hysterics have a preference for speed and dysthymics for accuracy in such test situations. The dysthymics, then, in the set used for the present study, would be at a disadvantage. Such remarks as "I must be the slowest person you've had for a long time", "I'm getting slower", "I hope I'm right but I don't know" were not uncommon in this group and indicate their discomforture in the situation. Conclusive reasons for this failure to confirm previous findings are, however, lacking.

The Maze W.D. score has been shown to correlate $-\cdot 55$ with Progressive Matrices in a psychoneurotic group (Foulds, 1951) so that differences would not be expected.

The Maze C.L. score would not be expected to show significant differences, since, in earlier studies (Foulds, 1951) Depressives score low and Anxiety States high. Combining these groups would, therefore, tend to mask differences from Hysterics.

The TAT Fluency score failed to differentiate, contrary to previous results (Foulds, 1953). Again no very convincing reason for this failure of confirmation can be offered. Testing was, however, carried out by a different psychologist who pressed for elucidation of points rather less and obtained, in consequence, rather shorter stories. It may be that dysthymics become especially inhibited when pressed. If this explanation be true, standardization of the procedure is inadequate.

Tests Showing Differences Between Personality Types

Maze L.P., Maze T.T. and Matrices time do not differentiate between groups with similar personality ratings, but do differentiate significantly between groups with dissimilar personality ratings, regardless of diagnosis.

The Superiority Index and the MMPI:Hostility Scale (Siegel, 1956) clearly behave in a very similar way. In these instances the scores of the Dh group fall mid-way. It is tempting to speculate that both the pre-morbid personality and the illness influence scores. One would suppose that these patients might originally have felt as superior and hostile as the hysteroid Hysterics, but that those factors which have led to their developing an Anxiety State or a Depression have also contributed to a reduction in their feelings of superiority and outwardly directed aggression. It is usually claimed in the literature (Curran and Guttmann, 1949; Henderson and Gillespie, 1950) that the majority of reactive depressives blame others, but that a minority blame themselves. Although the differences between the Dh and Do groups are not statistically significant, they suggest that the extra- and intropunitive depressives observed by the clinicians are likely to be the hysteroid and obsessive personalities respectively.

On each of the MMPI scales—Hysteria, Psychopathic deviant, Psychasthenia and Schizophrenia—the Dh group scores highest. This group complains of having "the mostest" and seems to be suffering from a free-floating disgruntlement.

Tests Showing Differences Between Diagnostic Groups

The third group of measures is obviously related to diagnosis. The distraction effect on maze tracing time, the difference between the Depressive and

Hypochondriacal Scales on the MMPI and the productivity on the TAT all behave in a very similar manner.

Original tracing time and distraction effect on the Mazes correlate ·51, yet the former is associated with the personality rating, the latter with the diagnostic category—Hysterics speeding up less than either Dysthymic group. This perhaps supports the view originally suggested that preferred speed of work may be slowed by pre-occupation with something other than the task in hand. Before their illness the Dh group may have been slightly quicker rather than slightly slower than the Hh group.

The excess of the Depression over the Hypochondriasis scale is more marked with the two Dysthymic groups, who both produce less on the TAT.

The Tapping Test was unfortunately not introduced at the beginning of the investigation and 12 subjects were missed. The scatter of the Hh group (14 cases) is significantly greater than that of the Dh group (22 cases). The difference between the two Dysthymic groups is clearly not significant; whereas the Hh:Do difference is significant with a χ^2 test, but not with the Mann Whitney U for $n_2=9$ to 20. It seems likely that with larger numbers this measure would relate to diagnosis rather than to personality type. Eysenck (1952), however, reports contrary results. He found the widest scatter amongst Anxiety States with Hysterics, Normals and Psychopaths following in that order. The difference in scoring system cannot account for this disagreement.

A simple scoring system can be adopted to obtain syndrome and personality scores for each subject. On each test the scores were cut into quintile divisions. Those falling within the first quintile division scored -2 (the Dysthymic end in the case of the syndrome tests, the obsessive end in the case of the personality tests) and so through -1; 0; $+1$ to $+2$ (the Hysteric or hysteroid end). The sum of the scores thus obtained on each of the three syndrome tests (Tapping being omitted as it had not been done by all subjects) constituted the "syndrome score". A similar procedure was adopted for six personality measures to give the "personality score".

Taking the optimal cutting point on the syndrome scale, 53 of the 68 cases, or 78 per cent., were in accord with the psychiatric diagnosis.

Taking the optimal cutting point on the personality scale, 53 of the 68 cases, or 78 per cent., were in accord with the personality rating. The "personality score" in fact correlated ·62 with the personality rating scale.

Sixty per cent. of the cases were in agreement with both the clinical diagnosis and the personality rating. The results appear sufficiently encouraging to warrant proceeding with cross-validation studies.

It is perhaps of interest that the attitude of the psychiatrist to the patient was associated with the personality rating scale.

Table III shows the psychiatrist's attitude plotted against his rating of the patient as hysteroid or obsessive.

TABLE III

The Psychiatrist's Attitude to the Female Psychoneurotic Patient in Relation to His Rating of Her Personality

	Sympathetic	Neutral	Hostile
Hysteroid	24	45	14
Obsessive	26	24	0

For $n=2$, $\chi^2=13{\cdot}09$; $P<{\cdot}01$ (close to ·001)

TABLE IV

The Psychiatrist's Attitude to the Male Psychoneurotic Patient in Relation to His Rating of His Personality

	Sympathetic	Neutral	Hostile
Hysteroid	7	27	22
Obsessive	19	21	3

For $n=2$, $\chi^2=19\cdot39$; $P<\cdot001$

TABLE V

The Psychiatrist's Attitude to Male and Female Psychoneurotic Patients

	Sympathetic	Neutral	Hostile
Women	50	69	14
Men	26	48	25

For $n=2$, $\chi^2=9\cdot68$; $P<\cdot01$

Table IV shows the similar comparison for male psychoneurotics.

Table V shows the attitude of the psychiatrist to male and female psychoneurotics irrespective of personality type.

There is thus a significant positive association between the psychiatrist's rating of either a psychoneurotic man or woman as obsessive in personality and his feeling of sympathy for that person. Male patients are disliked significantly more than female patients, particularly when they are hysteroid. Though these results may indicate a bias in the psychiatrist's rating, the personality types which emerge from this rating nevertheless provide an adequate bias for differentiating the performances of these groups on a number of psychological tests which have been objectively scored.

Since only about one-fifth of the ratings were done by female psychiatrists, it could not be reliably determined whether or not their attitudes differed from those of the male psychiatrists. There is a hint that she may be even more hostile to the hysteroid female patient than is her male colleague. The personality type of the psychiatrist has not—for diplomatic reasons—been taken into account.

DISCUSSION

If the results of this investigation were confirmed, it would appear that the value of classification of psychoneurotics in terms of symptom-clusters and of trait-clusters, even in its present crude form, would have been demonstrated as far as psychological testing is concerned. The advantages would be: (1) that the psychologist would have greater insight into what his measures were measuring (2) diagnostic differences with psychiatrists might often be found to be due to talking about different modes of classification; (3) two sets of measures would be available, one of which would be expected to remain relatively constant and the other to change with clinical improvement in the patient.

In this study more than half the women diagnosed as Anxiety States or psychoneurotic Depressives were rated as more hysteroid than obsessive in personality. Whilst it may well be that a larger proportion of obsessive Dysthymics would be found in Out-patient Clinics, the figures are sufficiently striking to suggest that it would be of considerable interest to try to relate the hysteroid and obsessive personalities to extraversion and introversion. If the hysteroid personality were found to correlate highly with extraversion and the obsessive with introversion as most people would anticipate, the correlation between extraversion and Hysteria and between introversion and Anxiety might well be considerably smaller than Jung supposed. The wisdom of taking diagnostic groups to establish dimensions of personality would then be questionable.

This two-fold classification within the psychoneurotic group might be a useful frame of reference for clinical studies. It might, for example, be worth enquiring whether the anxiety or the depression of the hysteroid Dysthymics do, in fact, follow the same course as that of the obsessive Dysthymics. If phobias are to be found in both groups, are they fears of the same types of impulse or situation?

For some considerable time doubt existed about the diagnosis, or the diagnosis was changed, in 15 out of the 68 cases. This applied to 4 of the 16 in the Hh group; 8 of the 26 Dhs; 2 of the 22 Dos and 1 of the 4 Hos. For $n=1$, $\chi^2=2{\cdot}71$, which approaches a p of $<{\cdot}05$. Diagnostic uncertainty is, therefore, likely to be more marked when the patient is rated as of hysteroid personality. This perhaps suggests that diagnosticians may sometimes change their universe of discourse from symptom to trait clusters and conversely. The patient initially diagnosed as an Anxiety State with a hysteroid personality is often found to settle down within a few days of entering hospital, possibly because entering hospital is part of her at least pre-conscious campaign for, say, bringing her husband to heel; whereas entering hospital for the obsessive woman may be an admission of failure. The psychiatrist becomes more aware of the histrionicity, the lability and shallowness of affect than of the now quiescent palpitations, tremors and free-floating anxiety. He shifts his attention from symptoms to personality traits and, it is suggested, mistakenly feels tempted to change his diagnosis to Hysteria.

One would above all wish to enquire why it is that two people rated as having similar types of personality do apparently develop different symptom-clusters. Could it be, for example, that the hysteroid individuals who develop an Anxiety State or a Depression are the ones who have tried to manipulate the psychological situation with hysterical symptoms, but have failed or have found themselves in a geographical situation in which this has not been possible? If the hysteroid woman's husband does not pay her sufficient attention, a paralysed arm may serve; if he has quite suddenly and unexpectedly departed to the moon with a blonde, it may not.

CONCLUSIONS

1. Sixty-eight psychoneurotic women admitted to hospital were classified as follows: 16 as Hysterics of hysteroid personality; 4 as Hysterics of obsessive personality; 26 as Dysthymics of hysteroid personality and 22 as Dysthymics of obsessive personality.

2. Psychological tests were administered to these groups and it was found that some measurements differentiated between Hysterics and Dysthymics regardless of personality type, others between hysteroids and obsessives regardless of diagnostic type.

3. The "diagnostic score" based on tests was in agreement with the psychiatric diagnosis in 78 per cent. of the cases. The same agreement was

obtained between the "personality score" based on tests and psychiatric ratings of personality type. The test scores were in agreement with both the diagnosis and personality rating by the psychiatrist in 60 per cent. of the cases.

4. It is suggested that adherence to some such double classificatory system as the one presented here may (*a*) increase the inter-judge reliability of diagnosis; (*b*) provide psychologists with one set of measures which should vary with the patient's clinical condition and another which should remain relatively constant.

Acknowledgments

I would like to thank Dr. R. Ström-Olsen, Physician Superintendent, for permission to publish this report and Dr. G. D. Fraser Steele and the psychiatric staff of his Division for carrying out the rating procedure.

References

Curran, D., and Guttmann, E., *Psychological Medicine*, 1949. Edinburgh: E. & S. Livingstone Ltd.
Eysenck, H. J., *The Scientific Study of Personality*, 1952. London: Routledge and Kegan Paul.
Foulds, G. A., *Brit. J. Psychol.*, 1951, **42**, 209–217.
Idem, *ibid.*, 1952, **43**, 33–41.
Idem, *J. Ment. Sci.*, 1953, **99**, 235–246.
Idem, *Psychologische Forschung*, 1955, **25**, 65–78.
Idem, *J. Clin. Psychol.*, 1958 (in the press).
Henderson, D. K., and Gillespie, R. D., *Textbook of Psychiatry*, 1950. London: Oxford University Press.
Himmelweit, H., *Brit. J. Psychol.*, 1946, **36**, 132–144.
Lewis, A., and Mapother, E., in *Price's Textbook of the Practice of Medicine*, 1941. London: Oxford University Press.
Siegel, S. M., *J. Abnorm. and Soc. Psychol.*, 1956, **52**, 368–372.
Whitehead, A. N., *Process and Reality*, 1929. London: Cambridge University Press.

FUNCTIONAL DISORGANIZATION OF THE LEFT LIMBS IN A TUMOUR OF THE CORPUS CALLOSUM INFILTRATING THE HEMISPHERES

By

R. KLEIN, M.D.

and

I. M. INGRAM, M.B., Ch.B., D.P.M.

Crichton Royal, Dumfries

Tumours of the corpus callosum (C.c.) are known to be a difficult diagnostic problem. Intellectual and mental disturbances and rapid deterioration in the course of the illness have been observed in most of these cases and are considered by many authors to indicate an involvement of this body (Lévy-Valensi, 1910; Mingazzini, 1922; Ironside and Guttmacher, 1929; Alpers and Grant, 1931; Voris and Adson, 1935; Schlesinger, 1951, Bremer *et al.*, 1956). However, a similar picture may also occur in tumours of other sites; moreover, tumours of the C.c. tend to infiltrate the hemispheres, particularly the cingulum and the frontal lobes, and this might well account for the mental picture. A sign which seems to be more specific for damage of the C.c. is dyspraxia restricted to the left limbs in right-handed persons. Although this dyspraxia has been reported only in a small minority of cases concerned, it has not been observed in lesions other than those of the C.c.

Dyspraxia confined to the left limbs was also a noticeable sign in the case described here and its clinical value as indicative of damage of the C.c. was confirmed at post-mortem. However, a detailed study of the picture showed that dyspraxia was only one of many signs of the disorganization of the left limbs; there seemed therefore to be a problem of a wider issue, and this is the main subject of discussion in this paper.

Clinical and Anatomical Findings

The patient, Mrs. E.R. was first admitted to hospital in February, 1955 at the age of 61. She had been a school-teacher and had for the last 5 years been running a small hotel with her second husband. She was described as a bright and cheerful person, and a good mixer. A few months before she came to hospital she seemed to be depressed and became worried about her eyes. She was apprehensive and lacked confidence. When examined, there was no loss of intellectual function, and no pathological finding on physical examination. She presented the picture of a depression. The depressive signs improved considerably after treatment in hospital, and she was discharged in March of the same year.

She was re-admitted 6 months later in September, 1955.

On this occasion she showed no symptoms of depression, but had a suspicious attitude and suspected that her food might have been poisoned. In addition there were now definite signs of an organic cerebral process. On neurological examination there was a bilateral papilloedema; the right angle of mouth was lower than the left; otherwise the cranial nerves were intact. She had a mild paresis of her right limbs and dragged her right leg when walking. There was a marked ataxia on the right hand, and an astereognosis on the right. An accurate assessment of sensation was not possible, partly due to difficulties in holding her attention in these tests, partly due to the disorganized actions of her left hand. On the right fingers there was a defect in position sense. She could distinguish everywhere between touch and prick, but no reliable information could be obtained as regards localization of tactile stimuli, for reasons which will be described later. The deep reflexes were increased on the right and at the later stage in the illness a positive Babinski was found on the right. Her gait was somewhat unsteady. In Romberg the unsteadiness increased and she tended to fall to the left. At first there was no visual defect on confrontation tests; later a definite left-sided homonymous hemianopia in the lower quadrant was found.

She showed a marked loss of memory, particularly for the recent past, and she could only vaguely recall more recent general happenings. Her attention for day to day happenings was considerably impaired. She was mentally quite alert. Information about her remote past was fairly adequate. She could give a satisfactory explanation of proverbs and gave adequate responses in similarity and difference tests. She could define correctly 37 words out of 45 in the Terman-Merrill vocabulary test. She had a quick grasp of pictorial situations such as depicted in Terman-Merrill, and in the T.A.T.

Her *attitude* towards her *illness* was usually one of neglect of her symptoms. On some occasions she would explain her difficulties such as her unsteadiness or weakness in her right arm or failure in writing or drawing, with her anxiety, insisting that it was a kind of psychological thing. On the other hand, she might state when she could not find the correct answer, that things were constantly disappearing from her mind as if they were blotted out.

The various specific functions were examined in a great number of sessions, and a film was taken of the actions of her hands; the following is a summary of these investigations:

Her *speech* was fluent without any mistakes; her *vocabulary* was very good and she could express herself well; there were no difficulties in *naming*. Her *spelling* was correct. *Reading* was fluent, and the *comprehension* of the written word was good. There was no disturbance in *visual recognition* of objects and pictorial situations. *Colour naming* and *sorting* were prompt. She did simple mental and written *arithmetic*, sometimes with slight mistakes, and more slowly than one would expect from a person who had been a teacher.

Handling of Objects: When asked to strike a match with her *left* hand, she opens the match box, then she shifts the matches about inside the box or puts one of the matches on top of the box; or she may hold the match in an awkward, inappropriate position, not knowing how to make the striking movements, or where to strike. She makes the correct movements immediately with the *right* hand. When asked to cut with scissors a sheet of paper into half with her *left* hand, she does not use the fingers appropriately for this action, does not get the scissors into the proper position, and will finally hold the closed scissors helplessly above the paper. She does it correctly with the *right* hand. When asked to turn, with the *left* hand, the wheel of a whisk, she is uncertain how to approach it, and finally turns the knob instead of the handle. When using a comb, with the *left* she may hold the comb uneasily in her left hand, not knowing what to do, or carry the comb to the forehead, and make up and down movements. She uses the comb and whisk correctly with her *right* hand. She may sometimes use her *left* hand appropriately; on one occasion she tied her laces, on another occasion she buttoned her dress correctly, but re-testing with a variety of objects always gave the same result: she had no difficulty in handling objects with her *right* hand, but was only rarely successful with her *left*.

Expressive and other willed movements of the hands: When asked to salute, wave, threaten or knock, she makes abortive or amorphous movements with her *left* hand. These movements are often stereotyped in character, and persevatory; the most frequent reaction is a movement of the forefinger towards the thumb. She cannot point out a figure or simple geometrical figures with her left fingers. When she is asked to bend or stretch the various joints of the left arm she is unable to do so. Her left arm may become rigid or she carries out mass movements. She is able to carry out the same orders correctly with the *right* hand.

Purposeful movements of the legs: She is unable to make a circle or mark out a number with her *left* foot. She cannot put her left heel or her toes on the floor, or swing her left leg to and fro. All these movements are carried out correctly with the *right* leg. She succeeds only occasionally when asked to lift the *left* leg, or *bend* it, but has no difficulty in these movements with the *right* leg. The movements with the left leg are as a rule amorphous and there is also strong perseveration.

She has difficulty in *dressing*, mainly because of inappropriate movements or confusion with her left arm. She may, with her left hand, tear at the cloth instead of slipping in, or does not know how to slip her left hand into the sleeve.

Body orientation: When asked to *point* at *various named parts* of the body with her left hand she either appears to be puzzled and confused or she may move the left hand about aimlessly, or use her right hand. She is only on rare occasions able to carry out the order correctly with her left hand. When she is ordered to carry out similar movements with her *right* hand, she does so correctly, when she had to point out parts of the right side of the body. She also points out correctly nose, mouth and forehead. But she is usually unable to point out with her *right* hand parts of the *left* half of the body. She will instead put her right finger to identical parts of the right side of the body or seems to be undecided where to point. On some occasions after she had pointed to corresponding parts of the right side instead of the left, when prompted to look for the other side, she says "It must be here"—pointing into space. The same reactions occur when she is asked to *point* to *specific fingers*; she can always point with her *right* hand to a finger named on the *right*, but is never certain as to the fingers of the *left*. She may for instance point at the left middle finger instead of the thumb, and then after a while, realizing it was wrong, point at the right direction, but not at the thumb itself. On one occasion when she had pointed before to the little finger and been asked to point to the middle finger, she again points to the little finger and says after a while "It seems funny that I should have two *first* fingers". She can name the parts of the body and the fingers on the *right* correctly, but she is often uncertain and makes mistakes when asked to name parts of the body, particularly the fingers on the *left*.

Once she puts her *left* hand into action she is able to touch or grasp objects in front of her; but often the left hand does not come forward, she remains motionless or uses the right hand instead. In the first period of observation she used her *right* hand promptly when asked to do so; in later stages it sometimes occurred that her right hand remained inactive, and very occasionally she would move her left hand instead.

Reaction to tactile stimuli: When tactile or painful stimuli were applied to the *right side* she could as a rule locate the stimuli when acting with her *right* hand. She could not do so when she had to use her left hand. When such stimuli were applied to the *left* side of the body, in particular to the extremities, she was usually unable to locate them with either hand, and she would often point into space or sometimes to the right side of the body; there was as a rule, some reaction indicating that she had perceived the stimulus. In these reactions there was no difference whether she had her eyes open or closed.

Writing, Drawing and Construction (Fig. 1): In the first period of observation she could *write* with her *right* hand on dictation letters and words correctly, with only an occasional slip. Later on, when longer words were dictated, she would easily tire and stop in the middle of them, and could not be induced to finish the word. The writing also became slow and laborious, and more uneven, probably because of the increasing motor paresis of the right hand. With her *left* hand she was not able to write at all. She made only haphazard strokes when letters or words were dictated; the result was the same when she was copying. She spelt words promptly without mistakes. She drew *figures* correctly with the *right* hand, but was not able to write on dictation or copy figures with the *left* hand.

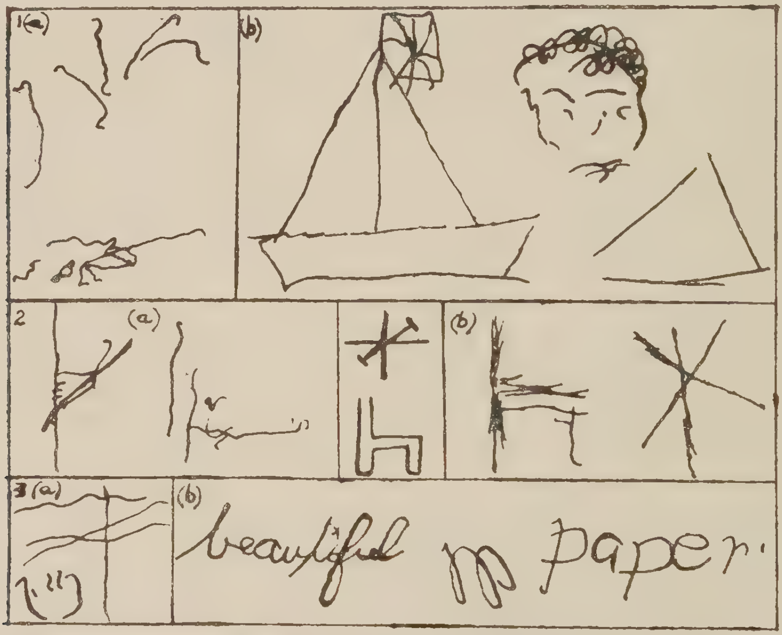


FIG. 1.—(1) *Free drawing:* (*a*) Left hand; no organized production is obtainable; (*b*) Right hand; boat, face, triangle. (2) *Copying of drawings:* (*a*) Left hand; (*b*) Right hand. (3) *Writing on dictation:* (*a*) Unorganized scribbling with the left hand; (*b*) Adequate writing with the right hand.

She could at the start *draw* simple objects such as a man, a boat, and geometrical figures such as a triangle and square in a fairly appropriate way with her *right* hand, and was able to copy more complicated patterns. Later on, the drawing with her right hand deteriorated to some extent. She made spatial mistakes, she had to be constantly prompted and often left the drawing incomplete. With the *left* hand she was incapable of drawing anything but haphazard lines, cross and square, without indication of any design. The copying with the *left* hand was much the same as the free drawing. She was entirely helpless with the *left* hand in copying of simple figures made of matches or in Kohs' blocks design, or wooden blocks, and did not know how to start; she interfered with the matches or blocks laid out, or shifted them aimlessly about. Only on one occasion was she able to do the formboard after many unsuccessful attempts.

She could carry out the same constructional tasks without difficulty with her *right* hand at the beginning of the observations, but in the later stages she became uncertain with this hand too and although she might start fairly adequately she could not complete the patterns, or get the blocks in the right order.

Stereognosis: She was unable to recognize objects by tactile means, with her *right* hand when the eyes were closed. With the *left* hand her reactions varied considerably; she would in a particular session identify some objects and not others, and would do better in some interviews than in others. She never had any difficulty in naming objects by visual exposure which she could not identify by tactile means.

The patient was sent to the Neurosurgical Unit at Killearn at the beginning of October, 1955 with the clinical diagnosis of cerebral tumour, probably originating from the C.c. An angiogram taken at this Unit showed a very large area of tumour vessels in the left parietal-parasagittal region, and some tumour vessels were also visible to the right of the mid-line. It was felt that this was a malignant glioma with a bilateral parasagittal distribution and no attempt was made to explore the lesion. The patient returned after 10 days to Crichton Royal. Subsequently the symptoms of the left limbs remained essentially the same; on the *right* hand writing and constructional disturbances appeared, though much less severe than on the left, and occasionally a hesitation in using her right hand when requested was noticed. Though the patient was quite alert and could still be tested, her retention and memory functions gradually deteriorated and she became more apprehensive and agitated when tested. At the beginning of 1956 she became more apathetic and less responsive, generally weaker, lost weight and was confined to bed; the motor paresis of the *right* arm and leg increased and there was also some loss of motor power on the left leg. She died on 22 March, 1956.

Anatomical Findings

On a sagittal section separating the hemispheres, a tumour can be seen which occupies four-fifths of the corpus callosum, leaving only the genu of the corpus callosum intact (Fig. 2). The tumour infiltrates both hemispheres, the left being more extensively damaged than the right. On both sides the posterior half of the cingulum is damaged. On the *left* there is a diffuse infiltration of the paracentral lobe and the praecuneus; on the *right* the infiltration is mainly confined to the cingulum.

Cross sections were carried out; *Section I* just in front of the temporal poles. It shows tumour tissue in the corpus callosum of both sides and infiltration of the lower portion of the cingulum, on the left more than on the right; on the left there is some expansion of the tumour into the central white matter.

Section II is just in front of the mammillary bodies. The C.c. is completely destroyed by the tumour on either side. On the *left* there is a total destruction of the cingulum, and some infiltration of the medial sector of the white matter of the frontal lobe. On the *right* the infiltration is limited to the lower portion of the cingulum.

Section III was carried out at the level of the geniculate bodies. The C.c. on both sides is entirely replaced by the tumour. On the *left* the tumour occupies a slightly larger area than on the previous section, destroying the cingulum, the medial sector of the white matter of the anterior central gyrus, and the lower part of its upper sector. On the *right* there is an infiltration of the lower portion of the cingulum and a slight damage of the most medial part of the white matter underlying the anterior central gyrus.

Section IV is at the level of the pulvinar. The C.c. is on both sides destroyed, the cingulum is on the *left* replaced by the tumour, on the right only its lower portion is damaged. The damage to the white matter is on the *left* more extensive than on the previous section; it involves again the medial sector but occupies more of its upper and lower portion. There is a fairly fresh haemorrhage into the lateral sector. The infiltration on the *right* is about the same as in the previous section.

Section V is just behind the thalamus. The area of infiltration is here at its largest on both sides. The damage to the C.c. and cingulum is about the same

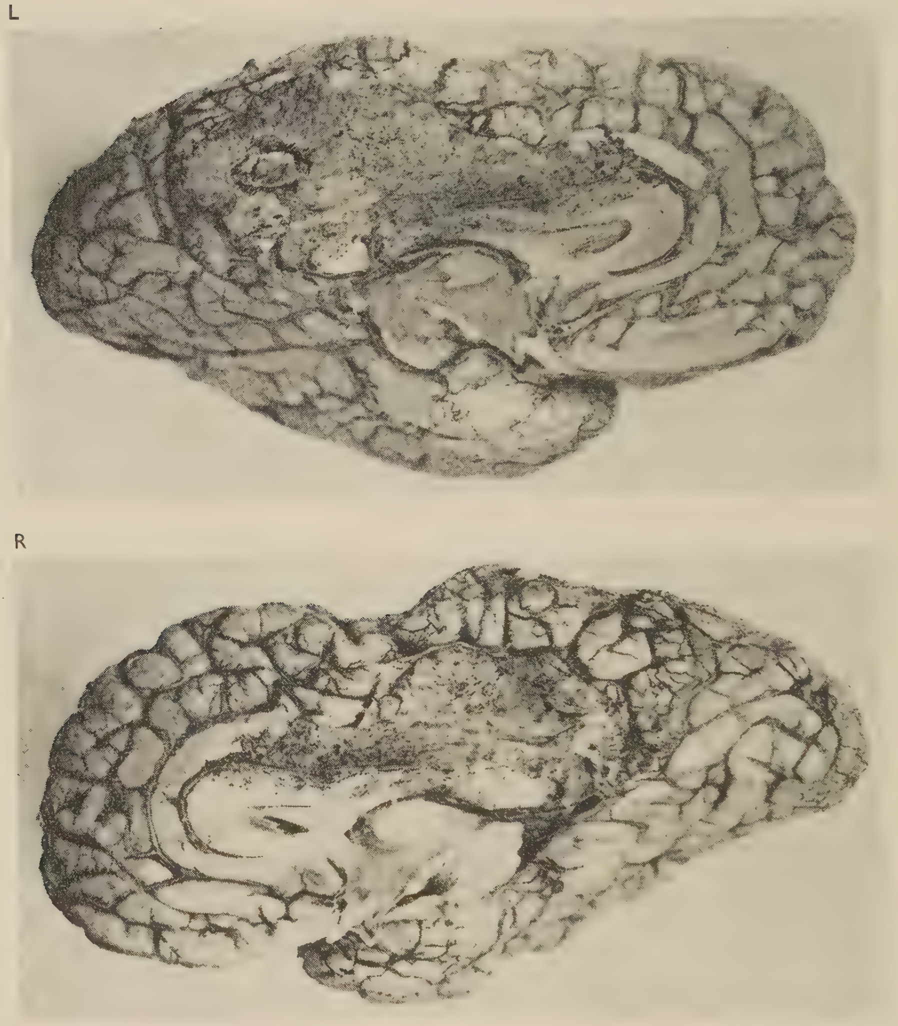


FIG. 2.—(L)=Left hemisphere: (R)=Right hemisphere.

as in the previous section. On the *left* there is an infiltration of the medial and central sector of the white matter underneath the posterior central gyrus, superior parietal lobe and hippocampus. On the *right* the tumour occupies mainly medial and lower parts of the white matter in the areas of the superior and inferior parietal lobe and hippocampus; there is a fairly recent haemorrhage in the joining lateral sector (Fig. 3).

Section V carried out on the parieto-occipital border. The tumour has, on both sides, considerably decreased in size. On the *left* it is of plum size and sharply demarcated, occupying the lower part of the cingulum. On the *right*, there is some infiltration of the central sector, damaging mainly the white matter of the superior parietal and angular gyrus.

The *histopathological* examination of the tumour showed the picture of a glioblastoma.

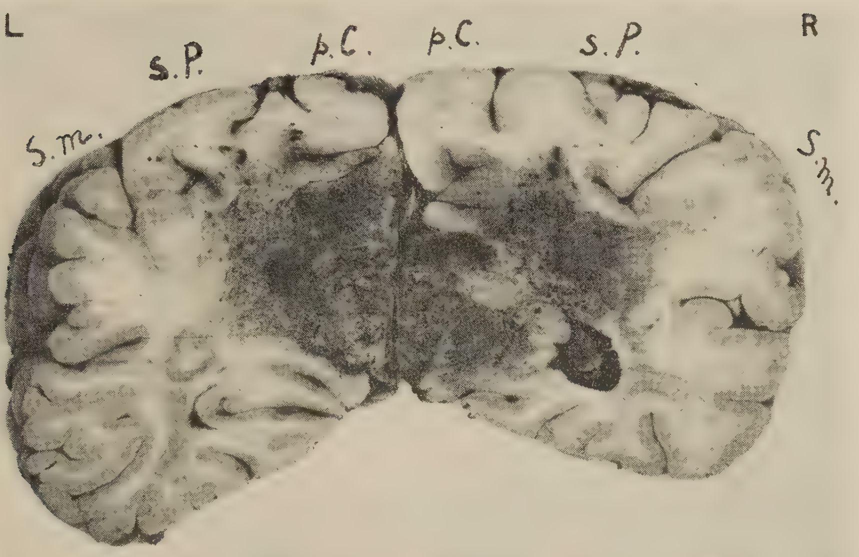


FIG. 3.—(L)—Left hemisphere: (R)—Right hemisphere: p.C.=Posterior central gyrus: s.P.=Superior parietal lobe: s.M.=Supramarginal gyrus.

SUMMARY OF CLINICAL AND ANATOMICAL FINDINGS

In a 61-year-old right-handed female patient with symptoms of increased intracranial pressure, the outstanding features were disorders at a higher level affecting the left extremities; there was a dyspraxia of both left limbs, a severe dysgraphia, severe constructional disorder, a finger agnosia and difficulty in identifying objects by tactile means, a non-realization of the left side, with autotopagnosia, and failure to locate sensory stimuli applied to the left extremities. There was no motor loss and probably also no sensory loss on this side. On the right there was a motor paresis, an ataxia and an astereognosis, and at a later stage, writing and constructional difficulties and on occasion some lack of awareness. Mentally she presented the picture of an amnesic syndrome.

A tumour was found which destroyed the C.c. with the exception of the genu, and infiltrated both hemispheres. The *left* hemisphere was infiltrated in its entire length; the largest damage was in the white matter of the anterior and posterior central gyrus. On the *right* there was a small lesion in the frontal region, and extensive damage of the white matter of the superior and inferior parietal lobe.

DISCUSSION

The most outstanding feature in the symptomatology of the case is the disturbance of the left extremities. Though it is not uncommon to find that a cerebral lesion affects a number of functions different in character, it is rare that such disturbances should affect only one side of the body, and in particular the left side in a right-handed person. However, among these disturbances in our case the dyspractic disorder and the imperception phenomenon are known to have particular relations to the left side of the body.

Dyspraxia has been observed as a rule in lesions of the left dominant hemisphere; it is then usually bilateral although less on the left than on the right limbs. Liepmann, who introduced this disorder, postulated (1900) that the dominant hemisphere regulates purposeful movements for both sides of the body, the left side being directed through fibres of the C.c. connecting corresponding areas of the right hemisphere. In accordance with this conception dyspraxia restricted to the left side could be expected to occur by damage of the C.c. and such cases have since been reported. However, this role of the C.c. has been more recently challenged in investigations carried out after surgical section of the C.c. (Akeleitis, 1942; Smith, 1952). Akeleitis found that a left-sided dyspraxia appeared only when at the same time clinical signs of damage of the hemispheres were present. This may, functionally, also apply to a case of softening of the C.c. described by Sweet (1941) in which dyspraxia of the left side appeared after ventriculography.

Only a small number of solely left-sided dyspraxia cases with anatomical findings are recorded: in all of them the C.c. was damaged (Foix and Hillemand, 1925; Critchley, 1930; Braunmühl, 1956). In the cases in which a more careful examination was carried out, dyspraxia was not the only disturbance of the left limbs. Agraphia of the left hand was noted in all the cases in which testing of writing has been mentioned. Astereognosis without sensory loss has been noted in the case of Vleuten (1908) and in that of Goldstein (1908) and in Case 15 of Akeleitis (1942). Liepmann and Maas (1908) noticed at some sessions that their patient always touched the wrong body parts, and the patient of Vleuten could not point with the left hand to anything outside her body or to any part of her body. Goldstein's patient remarked that "The arm and I are two different persons", and Akeleitis (Case 15) notes that the patient becomes confused and apprehensive when the left side was tested. These descriptions are very similar to the description given by our own patient.

There is more case material available in the literature as regards the *imperception of the left side of the body*. In the cases described, unawareness is usually the only manifestation of a disturbance at a higher level. It has for this reason, attracted particular attention, and has been considered a phenomenon with its special physio- and psycho-pathology (Pötzl, 1924; Klein, 1926, 1945; Conrad, 1930; Ehrenwald, 1931, Ives and Nielsen, 1932; Frantz, 1950; Hécaen and Ajuriaguerra, 1952; Critchley, 1956; and others). Imperception has been connected with the concept of the body scheme, i.e. the knowledge and awareness of the body and its parts and their relation at a given time. As the disturbance has mainly been observed in damage of the non-dominant right hemisphere, the suggestion has been made that the maintenance of the body scheme is a special function of the non-dominant hemisphere. The anatomical finding in the cases described shows great conformity; there is a lesion in the right parietal region which involves in some cases the cortex, in others the thalamus. This is also the area of the right hemisphere, which in our case has been mainly damaged. The clinical setting in these cases, is also fairly constant; together with the unawareness a severe motor and sensory loss on the left side is the rule. This occurs with such regularity that this loss, especially the sensory loss, has been regarded by some authors as the essential factor in the production of the imperception phenomenon. This particular setting has another aspect which is of no less importance, though it has not had the consideration it deserves. It is evident that the motor and sensory loss must necessarily greatly restrict the range of examination; thus it will not be possible to test the ability to carry out purposeful movements, writing or construction; in fact almost the only information about functions above a sensory-motor level which can under these circumstances be obtained as regards the left limbs, is that connected with awareness, the disturbance of which is the outstanding feature in these cases. Considering the incompleteness of the data, it therefore seems hardly permissible to regard this disorder as the fundamental problem; one will have to keep in mind that the actual disturbance may be much more extensive than it appears phenomenologically.

To sum up, considering the clinical data in left-sided dyspraxia and the particular setting in left-sided imperception, there is not enough justification to regard either of these phenomena as a distinct and separate problem which requires its own interpretation. In our case, in which a different setting permitted a more complete investigation, both these phenomena were part of a complex symptomatology.

When we described the symptoms of the left limbs in our case we applied the terminology generally used and thus distinguished disorders such as dyspraxia, astereognosis, agraphia, and so forth. Such distinction is made with reference to corresponding faculties which are regarded as special functions or relative entities of normal mental activity. It is the conventional approach to view disorders at a cognitive level in the light of such psychological or psychophysiological concepts. This reference to selective mental processes as regards disturbances due to cerebral damage and the corresponding terms, has been generally adopted, whatever the particular school of thought. Though this approach has proved to be in many ways profitable, there is no reason to believe that cerebral disorganization should necessarily follow this particular pattern.

In our case there can be no loss of faculties as such, since the patient is able to carry out the same tasks with her right limbs which she is unable to perform on the left side. The distinction of disorders, referring to special faculties, can therefore only be of descriptive value.

But this apart, the problem in our case is not the presence of one or another specific disorder, but the fact that the left limbs are disorganized *in all the modes of their activity* and that this affects the left limbs only; they are functioning at a purely sensory-motor level, and have more or less lost—this applies particularly to the hand owing to its high organization—all the qualities which constitute their specific character (R. Klein, 1930, 1947).

As to the *psychological* background and mechanism of the massive disorganization of the left limbs, the patient's reactions and her own description seem to point to a more general factor responsible for the disturbance. There is the panic reaction, the patient's complaint of going to faint, and the occasions of complete inertia when the left hand is being tested. The patient referring to her left hand, speaks of a "nerveless hand" which does not obey her, or of a "mixed up feeling". It appears that her difficulties arise whenever she has to *transact* and *mediate* cortical activity through her left limbs, regardless of the particular character of the task, or whether the task is simple or complex. When the patient operates her left limbs she does so without concept of space or sequence, she cannot make discriminations and classifications; there is no organization at a conceptual level and the general principles of an orderly thought process are missing. One can say that the patient operates the left limbs *without intelligence*. As she is able to carry out adequately corresponding tasks with her right limbs, we cannot assume that the intelligence necessary for these tasks is missing. One can regard intelligence as a *potential* which is normally *delegated* to such functional fields as the situation requires. It seems that this *delegation does not materialize* in our case when the left limbs are the agents of cortical activity; they are dissociated from this activity.

As to the *pathophysiological* mechanism of this dissociation of the left limbs, the *anatomical* findings of the case, the extensive character of the damage does not, at first sight, encourage an interpretation of the picture; there is a complete destruction of the C.c. with the exception of the most anterior part, and a deep infiltration of both hemispheres. However, the area of damage which can possibly be related to the left-sided symptomatology can be narrowed down. We can disregard the lesion of the left hemisphere as it can hardly be responsible for the homolateral disorder. We can also neglect the lesion of the right frontal region, where the damage was only very minor. There is therefore only the damage of the right parietal region and that of the C.c. to be considered.

Since the non-dominant right hemisphere is known to be of importance for a variety of functions at a higher level, it would not be surprising if it had also some role to play in such functions of the left limbs. This has some support from anatomical and physiological facts; the limbs and hemispheres represent a unilateral neuroanatomical unit and each pair of limbs has its own independent field of action. Significantly, the dyspraxia in our case leaves unaffected not only the right limbs, but also the bilaterally innervated facial muscles. Nor is it unexpected that the main damage of the right hemisphere should be situated in the parietal region; as this is the site of the damage in the cases of left-sided imperception, a phenomenon which is also part of the symptomatology we described. There is, however, this difference. In the imperception cases the area of the motor and sensory pathways is usually involved, whereas in our case this area is intact. We have previously discussed how this difference in the clinical setting may affect the phenomenology. Therefore it may well be that the massive disorganization which we found in our case expresses more accurately the pathophysiological significance of this area than the isolated imperception phenomenon in other observations. If this is the case, one could regard, in accordance with our previous conclusions, the right parietal region as an essential area of a circuit which has the task of maintaining the activities of the left limbs at a conceptual level.

More difficult to assess is the significance of the destruction of the C.c. in our case. The idea of a regulatory influence of the dominant hemisphere upon the motor actions of the non-dominant hemisphere by the fibre system of the C.c., attractive as it is, is not supported by more recent observations (Akeleitis, 1942; Smith, 1952). Bremer (1956) considering mainly animal experiments, suggests that the C.c. may be concerned with the "transference of amnesic acquisitions" from one hemisphere to the other. There is, however, no symptom or defect which would occur with some regularity after damage or sectioning of the C.c. in humans and in EEG records the bilateral synchronization of the fundamental cortical rhythm is still present after the C.c. had been sectioned (Hursch, 1954). One could imagine that the C.c. has a co-ordinating function between the two hemispheres during the period when cortical functions are in the stage of development. Once this phase has come to a conclusion and synchronization and co-ordination are well established, its importance may lessen; but when, subsequently, damage of significant areas of the more dependent, non-dominant hemisphere occurs, the fibres of the C.c. may serve to re-establish the co-ordination through other circuits. If, however, the C.c. is at the same time destroyed, as it is in our case, and in some cases of Akeleitis, this compensatory mechanism cannot operate. It may be that the disturbance of the left limbs in our case represents thus a maximum effect produced by the combined lesions of the right parietal region and the C.c.

The disorder of the left limbs was the most outstanding feature of our case; there was at the beginning no such disorder in the right limbs, although the patient had on this side a slight motor paresis and some sensory loss. But in the later stage she had difficulty in writing and construction also with her right hand, though less marked than with her left. It is possible that this may have been due to the local damage of the left parietal region, and was the beginning of a disorganization similar in character to that of the left limbs. But it is also possible that the progression in general intellectual loss played a part, as construction and writing are specially prone to be affected at a fairly early stage in dementing processes.

Finally, some remarks about the patient's attitude to her illness and defects. As regards her illness in general, she is rather casual, does not seem to be concerned, and does not feel there is much wrong with her. She will admit that her gait is somewhat unsteady and attributes this to her anxiety. Anxiety is frequently given as an explanation for her failures when being tested. On other occasions she may be well aware of her difficulties and describes for example very lucidly the character of her disturbance of her left hand. Then again she may neglect a particular defect as she does fairly consistently the weakness and ataxia of the right arm. In general, the awareness of the symptoms varies in degree, it is not constant for a particular symptom, and is fluctuating with the change of situation. There is obviously some fault in registration; she registers her defects only when stimulated, and when she does so the registration is only fleeting; it is consequently not consolidated and firmly established. The failure to realize alterations in bodily functions has usually been connected in the literature with the body scheme, and it has been more or less implied that there is a disturbance of this scheme in a *functional capacity*. This is clearly incorrect for our case, as it is probably for most other cases of this kind which have been reported. Our patient shows a marked amnesic syndrome; a disturbance in registering data, particularly those of recent origin, is characteristic for this syndrome. It results in a lowered awareness which is general and will necessarily affect new experiences of body functions, as it affects such experiences from other sources. This type of disturbance involves in our case also the left limbs; but there is at the same time an unawareness, which has nothing to do with retentive processes; it is an unawareness of the left limbs as such, of their place in space and even of their existence which is restricted to the left side. This is in our case part of the left-sided syndrome, discussed previously.

CONCLUSIONS AND SUMMARY

A disorganization in the responses of the left limbs is described in a 61-year-old right-handed female patient, who had a tumour of the C.c. which infiltrated both hemispheres. The patient was unable to use the left limbs in an appropriate and purposeful way, to differentiate their parts and locate them, to identify objects by tactile means, to write or construct with her left hand, and she was also unaware of her left limbs.

The conventional terms such as dyspraxia, agraphia, imperception and so forth, which denote these disorders, are in this case only of descriptive value; there was no loss of corresponding faculties as implied by these terms since the patient responded in most respects adequately with the right limbs. Nor, for the same reason, is the disorganization due to a lowering of general cortical functions. The nature of the disorganization is regarded as operational; the patient is unable to apply her intelligence when the left limbs are employed as the agents of cortical activity. We may consider intelligence as a potential which can normally be directed to any field of operation. In the case described, this shift failed to take place when the patient operated the left limbs.

In the light of the massive disorganization of the left limbs, the problem of left-sided dyspraxia and left-sided unawareness has been reviewed. There is evidence that the left-sided dyspraxia is, in the cases described, not the only disturbance at the conceptual level of the left limbs. As to unawareness of the left limbs, this is as a rule associated with motor and sensory loss on this side which greatly restricts investigation; disorders such as found in our case may therefore remain undisclosed. To approach these phenomena without considering this particular setting is likely to lead to false conclusions.

There was in our case, distinct from the imperception of the left limbs, which formed part of the left-sided syndrome, a lowered and fluctuating awareness of illness and of particular defects. This is part of an amnesic syndrome present at the same time.

Anatomically the damage which can be related to the left-sided syndrome was in our case the lesion of the right parietal region, and that of the C.c.; these are the areas which are involved in cases of left-sided imperception and left-sided dyspraxia respectively. It is suggested that the right parietal region may be a focal point in a circuit which maintains activities of the left limbs at a conceptual level, and that the C.c. may have a subsidiary role in that function.

LITERATURE

AKELEITIS, A. J., RISKEEN, W. A., and WAGENEN, W. P. VON, *Arch. Neur. Psychiat.*, 1942, **47,** 97.
ALPERS, B. J., and GRANT, F. C., *ibid.*, 1931, **25,** 67.
ARMITAGE, G., and MEAGHER, —., *Z. Neur. Psychiat.*, 1933, **146,** 454.
BREMER, F., BRIHAYE, J., and ANDRÉ-BALISAUX, G., *Schw. Arch. Neur. Psychiat.*, 1956, **78,** 31.
CONRAD, K., *Z. Neur. Psychiat.*, 1933, **147,** 346.
CRITCHLEY, M., *The Parietal Lobes*, 1953. London: E. Arnold & Co.
Idem, Brain, 1930, **53**, 120.
EHRENWALD, H., *Nervenarzt*, 1931, **4,** 681.
FOIX, CH., and HILLEMAND, P., *L'Encéphale*, 1925, **20,** 90.
FRANTZ, K., *J. Nerv. Ment. Dis.*, 1950, **112,** 240.
GOLDSTEIN, K., *J. f. Psychol. Neur.*, 1908, **11,** 270.
Idem, Neurol. Zbl., 1909, **28,** 898.
HARTMANN, F., *Mon. Psych. Neur.*, 1907, **21,** 97.
HÉCAEN, H., and AJURIAGUERRA, J. DE, *Méconnaissances et Hallucinations Corporelles*, 1952. Paris: Masson & Cie.
HURSCH, J. B., *Arch. Neur. Psychiat.*, 1945, **53,** 274.
IRONSIDE, R., and GUTTMACHER, M., *Brain*, 1929, **52,** 422.
IVES, E. R., and NIELSEN, J. M., *Bull. Los Angeles Neur. Soc.*, 1937, **2,** 1020.
KLEIN, R., *Mschr. Psychiat. Neur.*, 1926, **61,** 216.
Idem and MALLIE, P. P., *J. Ment. Sci.*, 1945, **91,** 518.
LÉVY-VALENSI, J., *Le Corps Calleux*, 1910. Paris.
LIEPMANN, H., *Das Krankheitsbild der Apraxie* (*Motorische Asymbolie*), 1900. Berlin: S. Karger.
Idem and MAAS, O., *J. f. Psychol. Neur.*, 1908, **10,** 214.
MINGAZZINI, G., *Der Balken*, 1922. Berlin: Julius Springer.
PÖTZL, O., *Z. Neur. Psychiat.*, 1924, **93,** 117.
SCHLESINGER, B., *Neurology*, 1951, **1,** 419.
SMITH, K. U., *J. Comp. Psych. and Psychol.*, 1952, **45,** 66.
SWEET, W. H., *Arch. Neur. Psychiat.*, 1941, **45,** 86.
VLEUTEN, C. F., *Z. Psychiat.*, 1907, **64,** 203.
VORIS, H. C., and ADSON, A. W., *Arch. Neur. Psychiat.*, 1935, **34,** 965.

THE EFFECTS OF HYPOPHYSECTOMY ON INTELLECTUAL FUNCTIONING*

By

MARTHA SCHON, Ph.D.

From the Section of Research Psychiatry
Sloan-Kettering Institute for Cancer Research
and the Neuropsychiatric Service
Memorial Hospital, Memorial Center for Cancer and Allied Diseases
New York, N.Y.

THE purpose of the present study was to evaluate the effects of hypophysectomy, the surgical removal of the pituitary gland, on the intellectual functioning of the individuals undergoing this particular form of surgery.

The pituitary gland, which is located at the base of the midbrain, is believed to control the activities of all other endocrine glands. Hypophysectomy is now performed in an attempt to induce remission of certain cancers suspected to be dependent upon endocrine gland factors (7). Luft and Olivecrona reported a survival duration of 3–28 months in patients with metastatic breast cancer who had undergone hypophysectomy (3). Ray and Pearson (10) reported an average remission of the disease of 7 months for the total group studied, with 22 months after surgery being the longest time of remission noted. Following hypophysectomy a deficiency state is created on all hormonal products of the pituitary gland. This type of hormonal deprivation is at present applied only to the advanced stages of cancer but the possibility exists that hypophysectomy may eventually become the preferred initial endocrine treatment for metastatic breast cancer (6). Ray suggests that even if hypophysectomy is not employed as the initial surgical procedure in altering the hormonal environment, it may be preferable to adrenalectomy as a second operation following castration (10).

When the first reports on hypophysectomy were received, some doubts were raised as to the value of this procedure. It was speculated that patients undergoing this type of surgery might become intellectually so deteriorated afterwards that the benefit of the prolongation of the lifespan might be offset by the possible mental incapacity. In addition, it was observed that most of the patients themselves who were faced with this type of surgery raised the question as to the possibility of mental deterioration following hypophysectomy. All these considerations gave the impetus to the present study.

Hypophysectomy involves two variables: (1) brain surgery, and (2) the elimination of the major source of endocrine stimulation and hormone production. A number of studies have reported impairment in intelligence, reasoning, and abstract functions resulting from frontal lobe defects. Rylander (11), Koskoff (2), Malmo (4), and Petrie (8) confirmed this contention. Damage to the frontal lobes by means of frontal lobotomy resulted in an impairment of

---

* This study was supported by research grant M-884 (C2) from the National Institute of Mental Health, National Institutes of Health, U.S. Public Health Service. The writer wishes to express her gratitude to Dr. Arthur M. Sutherland, Dr. Olof H. Pearson and Dr. Mortimer B. Lipsett of Memorial Center for Cancer and Allied Diseases for suggesting this study and for making the subjects available to this investigator.

intellectual functioning. In the present series of patients no lobotomy was performed; only a manipulation of the frontal lobe occurred. The frontal lobe was retracted in order to gain access to the pituitary gland (7). With respect to the endocrinological influence, Timme has already reported (12) that patients suffering from hypopituitarism give the impression of being mentally retarded though they are usually of normal or above normal intelligence. Timme believes that this impression is created because of their slowness of responses.

On the basis of these findings in the literature, it was hypothesized that hypophysectomy will not effect any significant changes in intellectual functioning, nor will it result in brain damage.

Procedure

Twenty white female patients, ranging in age from 40–66 years, who were suffering from metastatic malignant breast tumours suspected to be dependent upon endocrine gland factors were studied before and after hypophysectomy. All patients were tested with the Wechsler-Bellevue Intelligence Scale pre-operatively and 6–10 weeks post-operatively. This time interval was chosen as after a period of one month the patients are considered stabilized from a physiological point of view, and also in order to retest the patients as long as most of the pituitary hormones were still eliminated. Following hypophysectomy the hormones which are absolutely necessary for the maintenance of the functions of the living body are replaced. Thus, the hormone cortisone was administered just prior to, during, and immediately after surgery, while thyroid substitution hormones were administered later as the necessity arose. Hypothyroidism usually develops within 4–8 weeks following hypophysectomy and thyroid preparations were administered as soon as advanced features of thyroid deficiency were noted (7).

The Wechsler-Bellevue Intelligence Scale consists of a Verbal scale and a Performance scale. The Verbal scale consists of subtests which tap general information, memory for digits forward and backward, a similarity test which assesses the subject's logical thinking, a comprehension test which reveals the subject's ability to deal with practical situations, an arithmetic reasoning test, and, as an alternative, a vocabulary test.

The Performance scale includes the Picture Completion test, which measures the subject's ability to differentiate essential from unessential details, the Block-Design test, which reveals a number of temperamental traits, shows up mental deterioration and disturbances in the higher perceptual processes, the Object Assembly test, which reveals the subject's method of perception, the degree to which he relies on trial and error, and how he reacts to his mistakes, and the Digit Symbol test, which reveals the motor set and speed of the subject (13).

The Intelligence scale was administered and scored in the usual manner, according to Wechsler's Manual (13). Whenever any of the subtests had to be omitted for any reason, the scores were prorated in order to obtain an I.Q. The Verbal I.Q., the Performance I.Q., and the Full Scale I.Q. were calculated separately. The mean I.Q.s before surgery and after hypophysectomy were determined for the 20 patients and a t-test was applied in order to evaluate the statistical significance of the difference of the means obtained. As the means to be compared are based on the same individuals, the test of significance had to make allowance for the fact that the two sets of measurements were obtained from the same subjects and, therefore, not random with respect to each other.

Therefore, the difference between correlated means was calculated according to McNemar and the special formula for the standard error of the mean difference for small samples was used (5, p. 126). A t-value of at least 2·093 was considered significant at the ·05 level of confidence.

It was reasoned that, though the overall I.Q. might not reveal any change after surgery, nevertheless, some changes might have occurred in the various subtests on the basis of which the I.Q.s were calculated. Therefore, the raw scores of each pre- and post-operative subtest were submitted to a statistical test of significance as described above.

In order to assess whether intellectual impairment had occurred as a result of brain damage following hypophysectomy, two methods were used. (1) Certain subtests of the Wechsler-Bellevue Scale which are considered as diagnostic indicators of brain damage were carefully evaluated. Wechsler states that, in general, the symptoms of brain damage are "disturbances in the visual motor spheres, a loss of shift, various memory defects, and a falling off of capacities involving organization and synthetic ability" (13, p. 153). Wechsler believes that there is a constant falling off of the scores on the following subtests: Block Design, Digit Symbol, Arithmetic, Memory for Digits Backwards, Similarities, and possibly Object Assembly. Therefore, special emphasis was given to the scores of these subtests. Most of the investigators using the Wechsler-Bellevue Scale with brain-injured patients noted a severe impairment of their performance on the Block Design test (1, p. 115). (2) The "differential-test-score method" for measuring mental deterioration was applied. This method is based on the normal decline of intellectual functioning with age. A certain degree of mental deterioration is expected with advancing age. However, if this degree exceeds the one of normal deterioration, it is considered pathological (13, p. 63). The "per cent loss of mental deterioration" was calculated for the pre- and post-operative group.

The same statistical procedure as outlined above was applied to both methods in order to assess the significance of intellectual impairment as a reflection of brain damage incurred during the surgical procedure.

No adequate control group could be obtained for this experiment. The ideal control group would have been a series of similar cancer patients undergoing the same surgical procedure as in hypophysectomy without having the pituitary gland removed. However, for obvious reasons, this was not possible. It was, therefore, decided to compare the results of this study with the findings on the effects of brain surgery as reported in the literature.

RESULTS

In general, no statistically significant changes could be noted between pre- and post-operative intellectual functioning. The mean pre-operative Verbal I.Q. was 103 and the mean post-operative Verbal I.Q. was 102·2. On the Performance scale a mean I.Q. of 101·4 was obtained pre-operatively and the post-operative mean was 103·1. The pre-operative Full Scale I.Q. showed a mean of 102·8 and the post-operative mean 103·1. Neither the Verbal I.Q., nor the Performance I.Q., nor the Full Scale I.Q. changed significantly as a result of hypophysectomy for the group as a whole. Also, no significant difference occurred on the raw scores of the various subtests except in two; the subtests "Information" and "Picture Completion" showed a post-operative significant increase in raw scores. Though no significant difference in the raw scores could be noted on the subtest "Block Design", which is considered an excellent test of general intelligence, nevertheless, the time necessary, as measured in seconds, to complete the various block designs showed a significant post-operative increase. These findings are illustrated in Table I.

TABLE I

Significance of Difference Between Pre- and Post-operative Measurements on the Wechsler-Bellevue Intelligence Scale in the Hypophysectomy Group

Measurement	t-value
Verbal I.Q.	·82
Performance I.Q.	1·33
Full scale I.Q.	·293
Information	2·18*
Digit span	·376
Comprehension	1·74
Arithmetic	·308
Similarities	·65
Vocabulary	·81
Picture completion	2·2*
Block design	1·25
Object assembly	·825
Digit symbol	1·072
Time needed on Block design	3·23*

* Significant at the 0·5 level of confidence.

An examination of the pre- and post-operative raw scores of the subtests considered indicators for brain damage revealed that no significant change has occurred post-operatively in this respect. Furthermore, the difference between the pre- and post-operative "per cent. loss of mental deterioration", another indicator of brain damage, showed that no significant change could be noted post-operatively. These data are compiled in Table II.

TABLE II

Significance of Difference Between Pre- and Post-operative Measurements on the Indicators for Brain Damage

Indicator	t-value
Block design	1·25
Digit symbol	1·072
Arithmetic	·308
Digits backward	1·143
Similarities	·65
Object assembly	·825
Per cent. loss of mental deterioration	·555

A t-value of at least 2·093 is considered significant at the ·05 level of confidence. None of the above t-values is significant.

From the above results it appears that our hypothesis is confirmed. No significant changes seem to have occurred in intellectual functioning and no measurable brain damage, as determined by the tests, could be noted as a result of hypophysectomy in the patients under study. However, a significant increase in general information and the ability to distinguish the essential from non-essential details, i.e. in the power of observation and in accuracy, seem to have occurred. Furthermore, a significant increase in the time necessary to perform on a test which requires a simultaneous performance of visual and motor abilities could be noted.

DISCUSSION

The connection of the pituitary gland to other areas of the brain is not well understood—whether impulses are transmitted from the more distant brain centres to the pituitary gland or vice versa. From the above results, one can conclude, in general, that the pituitary gland does not seem to have any influence on the intellectual functioning of the individual. It also appears that the severance of the fibres which might connect the pituitary gland with those regions of the cortex of the brain which are generally considered as the centres of the individual's reasoning power and abstract ability, has no effect on the adequate functioning of the intellect.

A comparison of the results of the present experimental group with the findings in the literature, which report the effect of brain surgery on non-psychotic patients, reveals that mere manipulation of the frontal lobe, which is involved in hypophysectomy, does not result in decreased intellectual functioning, while lobotomy effects a significant decrease in general intelligence.

Rylander (11) studied six cases, who suffered from different types of severe neuroses, on whom frontal lobotomy was performed as the choice of treatment. He reported a significant mean I.Q. decrease of 11·6 points on the Stanford Binet test in five cases. Malmó (4) reports a significant post-operative mean decrease of 8·3 points of I.Q. on the Wechsler-Bellevue Scale in six neurotic patients on whom frontal lobotomy and frontal gyrectomy was performed. Koskoff and his associates (2) studied seven cases on whom frontal lobotomy was performed for the alleviation of intractable pain. They report a post-operative mean decline of 20·4 points of the Full Scale I.Q. in five cases. Petrie (8) reports, in 20 neurotic patients on whom a prefrontal leucotomy was performed, a significant post-operative decrease of 5 points on the Full Scale I.Q. on the Wechsler-Bellevue Scale. She also noted a decrease in accuracy and an increase in speed in some of the special tests she used to evaluate temperament (9). In the present study, a significant increase in accuracy and a significant decrease in speed could be observed post-operatively. Petrie attributes her findings partly to a change in temperament post-operatively. She believes that the post-leucotomy patients show a decrease in neuroticism which also affected the performance on the intelligence test. She feels that the neurotic is slower and more accurate because of his disposition to rigidity and deliberation.

In line with Petrie's assumptions, it appears that the improvement in accuracy and the decrease in speed in the present experimental group could possibly be the result of an increased "neuroticism", due to the elimination of the hormones; however, it seems to this investigator that the patients exhibited a greater degree of accuracy post-operatively, possibly because they experienced an improved sense of physical well being after surgery. The significant increase in accuracy ("Information" and "Picture Completion") may also be simply the result of the practice effect gained through retesting. The decrease in speed appears to be related to the effects of the elimination of the thyrotropic hormones, i.e. the slowness in response may be attributed to a secondary hypothyroidism resulting from the pituitary deficiency.

SUMMARY

1. The intellectual functioning of twenty white female patients, suffering from metastatic breast cancer, who underwent hypophysectomy as a therapeutic measure to check the progress of the disease, were studied pre- and post-operatively.

2. It was hypothesized that hypophysectomy will have no effect on the intellectual functioning of the individuals under study and that no brain damage will occur as a result of this surgery.

3. No statistically significant change in general intellectual functioning and no brain damage, as measured by the tests, could be noted post-hypophysectomy. Thus, the hypothesis was confirmed.

4. An increase in accuracy, possibly as a result of a post-operative improvement in health or due to the practice effect involved in re-testing, and a decrease of speed, probably related to a secondary hypothyroidism because of a deficiency of pituitary hormones, could be noted.

BIBLIOGRAPHY

1. KLEBANOFF, S. G., SINGER, J. L., and WILENSKY, H., "Psychological consequences of brain lesions and ablations", *Psychol. Bull.*, 1954, **51,** 1–41.
2. KOSKOFF, Y. D., DENNIS, W., LAZOVIK, D., and WHEELER, E. T., "The psychological effects of frontal lobotomy performed for the alleviation of pain", in *The Frontal Lobes*, 1947. Baltimore: Williams and Wilkins Co., pp. 691–702.
3. LUFT, R., and OLIVECRONA, H., "Hypophysectomy in man", *Cancer*, 1955, **8**, 261–270.
4. MALMO, R. B., "Psychological aspects of frontal gyrectomy and frontal lobotomy in mental patients", in *The Frontal Lobes*, 1947. Baltimore: Williams and Wilkins Co., pp. 537–564.
5. McNEMAR, Q., *Psychological Statistics*, 1949. New York: John Wiley and Sons.
6. PEARSON, O. H., LI, M. C., MACLEAN, J. P., LIPSETT, M. B., and WEST, C. D., "Management of metastatic mammary cancer", *J.A.M.A.*, 1955, **159,** 1701–1704.
7. PEARSON, O. H., RAY, B. S., HARROLD, C. C., WEST, C. D., LI, M. C., MACLEAN, J. P., and LIPSETT, M. B., "Hypophysectomy in treatment of advanced cancer", *ibid.*, 1956, **161,** 17–21.
8. PETRIE, ASENATH, "Preliminary report of changes after prefrontal leucotomy", *J. Ment. Sci.*, 1949, **95,** 449–455.
9. *Idem, Personality and the Frontal Lobes*, 1952. London: Kegan Paul Ltd.
10. RAY, B. S., and PEARSON, O. H., "Hypophysectomy in the treatment of advanced breast cancer", *Ann. Surg.*, 1956, **144,** 394–403.
11. RYLANDER, G., "Personality analysis before and after frontal lobotomy", in *The Frontal Lobes*, 1947. Baltimore: Williams and Wilkins Co., pp. 691–702.
12. TIMME, W., ANGUS, M. F., and HARE, C., *The Pituitary Gland*, 1938. Baltimore: Williams and Wilkins Co.
13. WECHSLER, D., *The Measurement of Adult Intelligence*, 1944. Baltimore: Williams and Wilkins Co.

INVESTIGATION OF A NEW COMPOUND, B.W.203, AND OF CHLORPROMAZINE IN THE TREATMENT OF PSYCHOSIS

By

B. G. FLEMING, L.R.C.P.&S.I., D.P.M.
Research Medical Officer

and

J. D. C. CURRIE, M.B., B.S., D.P.M.
Senior Hospital Medical Officer
Powick Hospital, near Worcester

INTRODUCTION

THE discovery of chlorpromazine in the Rhône-Poulenc-Spécia laboratories in France, and the subsequent early clinical studies which were carried out in that country, for example in 1952 by Hamon *et al.* (5) and in 1953 by Delay and Deniker (1), eventually resulted in the enthusiastic and widespread application of this compound in the field of clinical psychiatry. Chemists and pharmacologists, in many countries, have been actively engaged during the ensuing years in the search for new compounds which might prove to be more potent therapeutic agents than chlorpromazine in the treatment of mental illness. One of the tangible manifestations of their labours is the present crop of "tranquillizers" which are being extensively used in the treatment of neurosis and psychosis. Whereas opinion may be divided with regard to the real or specific value of any one of these new drugs, few would disagree with the contention that none of them is ideal. Despite the considerable number and variety of phenothiazine derivatives and other new substances which have been developed as a result of extensive research, chlorpromazine has retained much of its original therapeutic reputation, in open competition with its rivals, down the years, and is still probably the most widely used tranquillizer today. This would seem to imply that no outstanding advance has been made since the early days of the new biochemical era in psychiatry. Valuable knowledge may have been obtained as a result of the application of scientific theory and empirical methods in this field, but in terms of effective therapeutic agents the results have been meagre, with the accent on quantity rather than quality. Nevertheless, a continued search is justifiable, and any new compound which holds forth promise must be put to a clinical test if final success is to be assured and if valuable therapeutic potential is not to be summarily dismissed or heedlessly cast aside.

In the light of these considerations we carried out a controlled trial of a new biochemical compound, B.W.203, (Burroughs Wellcome) in the treatment of psychosis. The chemical formula of this compound is as follows: unsymmetrical *n*-butyl-o-anisyl urea. Pharmacological investigations revealed that it is relatively non-toxic, and behaviour studies in cats suggested that "contentment and sociability" were increased, and "defensive hostility" was diminished, at dose levels of 20 and 40 mg./Kg. The trial, which forms the subject matter of this paper, enabled us to make direct comparisons between the effects associated with B.W.203, chlorpromazine, and a placebo. In this way the new compound might be compared with the original and most firmly established of the tranquillizers, and either might be measured against that time-honoured remedy the "placebo". The results we obtained are illuminating in certain respects, and, we hope, may be of some general interest.

METHOD

The patient material selected to test the psycho-trophic or "tranquillizing" properties of B.W.203, comprised 36 in-patient psychotics, of whom 34 were chronic schizophrenics, the remaining 2 being chronic manic-depressive psychotics. The sex distribution was, 25 males and 11 females. The over-all average age of the patients was 46·8 years, with an average duration of illness of 16·7 years. (Since 3 main and different wards were utilized in the trial, the following details relating to the patients in these wards may be relevant: Ward A—Average age 49·0, duration of illness 9·6; Ward B—Average age 47·8, duration of illness 17·5; Ward C—Average age 44·5, duration of illness 20·4). Approximately two-thirds of the trial patients were over-active, the remainder being under-active.

The trial was a comparative one, entailing the use of three different preparations, namely, B.W.203, chlorpromazine, and a placebo, so that the therapeutic efficacy of any one of these three preparations might be directly compared with that of either of the other two. The tablets, for oral administration, of the three preparations were identical in appearance, and were dispensed on a "blind" basis so that the pharmacist alone knew which preparation a particular patient was receiving at any time during the trial. Each patient acted as his, or her, own control, receiving by pre-determined design each of the three preparations consecutively.

The tablets of B.W.203 were 300 mg. in strength, and those of chlorpromazine were 25 mg. The duration of the trial was 12 weeks, divided up for each patient into 3 treatment periods during which the patient received each of the three preparations consecutively, in a pre-arranged sequence, as tabs. 1 b.i.d. for one week, followed by tabs. 2 b.i.d. for a further week, and tabs. 2 t.i.d. for the remaining two weeks of each 4-week period.

In this way each patient, in whichever 4-week period of the trial, received B.W.203 as 600 mg. daily for one week, 1,200 mg. daily during the ensuing week, followed by 1,800 mg. daily for two weeks; and chlorpromazine as 50 mg. daily for one week, 100 mg. daily during the next week, followed by 150 mg. daily for two weeks. Likewise, each patient during one of the three 4-week periods received placebo as tabs. 1 b.i.d. for one week, followed by tabs. 2 b.i.d. for a further week, and finally tabs. 2 t.i.d. for the remaining two weeks. This dosage regimen was considered to provide a reasonably comprehensive range of testing for Compound B.W. 203, and to reach a therapeutic level for chlorpromazine, if not necessarily the optimal one in each case, without reaching an upper level at which obvious side-effects such as gross pallor, hypotensive attacks, or Parkinsonian symptoms might be expected to appear and rob the trial thereby of its "blind" and, therefore, objective characteristic.

For purposes of comparing not only any differences in response of each of the 36 patients to the three treatments, but also to enable some judgment to be made with regard to whether a particular order or sequence of administration of these treatments was more, or less, effective than others, the patients were divided on a random basis into 6 sets comprising 6 patients per set. Each set was assigned exclusively to one of the 6 possible sequences in which the three preparations might be administered:

	1st 4-week Period	2nd 4-week Period	3rd 4-week Period
(i)	Placebo	B.W.203	Chlorpromazine
(ii)	Placebo	Chlorpromazine	B.W.203
(iii)	B.W.203	Placebo	Chlorpromazine
(iv)	B.W.203	Chlorpromazine	Placebo
(v)	Chlorpromazine	Placebo	B.W.203
(vi)	Chlorpromazine	B.W.203	Placebo

From this arrangement it may be seen that in any one period of the trial, equal numbers of patients were receiving any one of the three preparations and, furthermore, comparable numbers of patients followed each of the six possible treatment sequences.

A dispenser's code was compiled, in advance, for the whole trial to conform to these fulfilments or requirements, and this code was subsequently divided into 3 parts so that the dispenser, at the outset, received only that part of the total code relevant to the first 4-week period. The second and third parts of the code were issued to the dispenser as and when they were required.

In advance each patient was assigned, upon a random basis, to one of the 6 treatment sequences to which he, or she, conformed throughout the trial. In no instance was there any deviation from the pre-arranged sequence, duration of treatment, or dosage, so that the initially adopted design of the trial was strictly adhered to throughout. Two patients were, however, withdrawn from the trial, one within the first week as a result of failure to co-operate in taking the tablets; the other due to the development, in the second 4-week period, of neutropenia (found to be associated with chlorpromazine).

The therapeutic efficacy of each preparation was to be judged in terms of the pre-selected forms of observations or measurements of clinical change, which were to be recorded during the trial. These consisted of: (*a*) weekly global assessments made on each patient, and representing the combined judgments of nursing staff and psychiatrist; (*b*) numerical scores derived from the application of a comprehensive 4-point 52-item psychiatric rating scale.

(*a*) All of the weekly global assessments were made by the same psychiatrist (B.G.F.), but a contribution to these was made by the nursing staff in the 3 main and different wards from which the patient material was selected.

(*b*) The rating-scale is one which was originally conceived by Dr. A. M. Spencer, and finally elaborated in its present form by the joint contributions of a number of his colleagues and staff. It will almost certainly be the subject of a published paper in due course, for which reason, together with the fact that the present writers were merely secondary contributors to it, details of the scale must, perforce, be omitted from the general description as given herewith. Suffice it to say, therefore, that it is a most comprehensive scale which, if skilfully applied, tests virtually the whole potential range of psychiatric abnormality as manifested by acute or chronic psychotic patients. The trial patients were individually rated on two separate occasions before the commencement of treatment. This dual rating was undertaken despite the considerable time factor involved, because the initial total score for each patient was to constitute the standard with which subsequent scores were to be compared, and it was considered that the mean of two initial total scores would represent a more reliable permanent standard than a single total score recorded on one occasion for each patient. The product-moment correlation coefficient which was found to obtain between the two sets of initial rating scores was statistically significant at better than the 1 per cent. level of confidence:

$$r=0\cdot86,\ df.\ 34,\ P=<0\cdot01$$

At the end of each 4-week period the patients were re-rated, so that at the conclusion of the trial "improvement" scores, positive or negative, representing the difference between the initial mean total scores and the subsequent total scores, would be available for analysis.

The statistical techniques, by which the significance of the results was to be assessed, were to comprise the application of a chi-square test to the global assessments, and an analysis of variance to the rating scale scores. It was hoped that this latter analysis, besides indicating the significance of any differences between the mean improvement scores for the three preparations, might also provide some information concerning the individual efficacy of the sequences in which they were administered, and as to whether there was a significant difference between the response of the patients in the three different wards.

All specific methods of treatment, physical and medicinal, were withheld from all the trial patients for a period of some two weeks prior to the commencement of the trial. Throughout its subsequent duration the three test preparations were the only medical forms of therapy administered to any of the patients. (There was a single exception to this in the case of a manic-depressive woman who became so unmanageable, during the first four-week period of the trial, that a member of the medical staff deemed it imperative to administer E.C.T. to her on two consecutive days. She was retained in the trial, and final decoding revealed that she had been receiving B.W.203 at this unfortunate time.)

No deliberate attempt was made to study the side-effects of the preparations, as to do so, however interesting and valuable in itself, would have inevitably militated against the all-important "blindness" of the trial. Nevertheless, before the commencement of the trial, and following each four-week period, blood and urinary investigations were carried out, mainly as a precautionary measure. The patient who was withdrawn after six weeks was found to have developed a leucopenia (neutrophil count=48 per cent.), and it is felt that when a potentially agranulocytic drug such as chlorpromazine is being used in a therapeutic trial periodic white cell counts are imperative. The patient concerned, in this instance, was withdrawn before decoding, and her therapeutic responses for the six weeks during which she was in the trial cannot be included in the results of the 34 patients who completed the trial.

Results

The results are presented in summary form in Tables I–IV, which are appended, with the statistical interpretation expressed underneath each in the conventional manner. In terms of the rating-scale scores, recorded during the trial, the mean improvement scores associated with the three preparations were 5·73, 3·15, and 2·81 for the placebo, chlorpromazine, and B.W.203 respectively. However, the differences between these means, when subjected to an analysis of variance, are not statistically significant. Likewise, the differences between the mean improvement scores for the six different sequences of administration of the three treatments, and for the three main wards from which the trial patients were selected failed to reach a statistical level of significance.

TABLE I

Analysis of Variance

	Rating-scale Improvement Scores		
	df.	ss	Variance
Sequences	5	425·01	85·0
Wards	2	44·46	22·23
Treatments	2	176·80	88·40
Residual	92	6,990·31	75·98
Total	101	7,636·58	

Differences between treatments: F ratio=1·16, df. 2 and 92, P=>0·05, not significant
Differences between sequences: F ratio=1·12, df. 5 and 92, P=>0·05, not significant
Differences between wards: F ratio=3·4, df. 2 and 92, P=>0·05, not significant

TABLE II

Analysis of Weekly Global Assessments for Whole Trial

Assessment	Placebo	B.W.203	Chlorpromazine	Total
Improvement ..	84	68	74	226
No change ..	39	37	44	120
Deterioration ..	13	31	18	62
Total ..	136	136	136	408

Differences between 3 treatments: χ^2=9·4, df. 4, P=<0·06, significant at 5 per cent. level
Differences between Placebo and B.W.203: χ^2=8·06, df. 2, P=<0·02, significant at 2 per cent. level
Differences between Placebo and Chlorpromazine: χ^2=1·24, df. 2, P=>0·50, not significant
Differences between B.W.203 and Chlorpromazine: χ^2=3·56, df. 2, P=>0·10, not significant

TABLE III

Analysis of Consistent *Improvements as Expressed by 4 Consecutive Positive Global Assessments in Any One 4-Week Period*

	Placebo	B.W.203	Chlorpromazine	Total
Improved ..	10 (29·4)	7 (20·6)	8 (23·5)	25 (24·5)
Not improved ..	24 (70·6)	27 (79·4)	26 (76·5)	77 (75·5)
Total ..	34 (100)	34 (100)	34 (100)	102 (100)

(Percentages in brackets)

Differences between treatments: χ^2=0·32, df. 2, P=>0·50, not significant

TABLE IV

Analysis of Consistent *Deterioration as Expressed by 4 Consecutive Negative Global Assessments in Any One 4-Week Period*

Placebo	B.W.203	Chlorpromazine
0 (0%)	4 (11·8)	0 (0%)

P value for a chance distribution of this order (0–0–4, 0–4–0, or 4–0–0)=<0·05
Differences between treatments are significant at the 5 per cent. level of confidence.

In terms of the global assessments, made each week on all 34 patients who completed the trial, there was a statistically significant difference in the results for the three treatments. The chi-square value for all of these assessments is within one decimal point of the required figure for significance at the 5 per cent. level of confidence, and, therefore, may be accepted at this level, and certainly at better than the 6 per cent. level of confidence. This would seem to justify making direct comparisons between the three treatments in terms of the global assessments associated with each. When this is done a significant difference at better than the 5 per cent. level of confidence, in fact at the 2 per cent. level, is found to obtain between the results for the placebo and B.W.203 with the former quite clearly superior to the latter. The differences between the placebo and chlorpromazine, and between B.W.203 and chlorpromazine do not reach a significant level of confidence. The reason why a statistically significant difference was found between all three treatments and between the placebo and B.W.203, would appear to be due mainly, as may be seen from Table II, to the greater number of "deterioration" assessments associated with B.W.203.

In analysing the weekly global assessments it was found that some of the patients were consistently, that is for each and every week of a particular four-week period, recorded as being improved or deteriorated. The therapeutic performances of the three treatments in terms of this consistent response are presented in Tables III and IV. The percentages of patients who were consistently improved, and the particular preparation with which this improvement was associated, were as follows: 29·4 per cent., 23·6 per cent., and 20·6 per cent. for placebo, chlorpromazine, and B.W.203 respectively. The differences between these improvement proportions is not statistically significant. The percentages of patients who were recorded as being consistently deteriorated were: 0 per cent., 0 per cent., and 11·8 per cent. for placebo, chlorpromazine, and B.W.203 respectively. The differences between the three treatments, in terms of consistent deterioration, are significant at the 5 per cent. level of confidence, and reflect the poor record of B.W.203 in this respect.

Side-effects and toxic manifestations in general were remarkably few. Several patients became over-active, and some of these displayed mild euphoria, but decoding at the end of the trial revealed that these reactions were more or less equally associated with each of the three treatments. One patient developed a raised serum bilirubin level, of 1·55 mg. per cent., with B.W.203; and another patient developed an early depression of bone-marrow function as evidenced by a fall in the neutrophil count to 48 per cent., with chlorpromazine.

Discussion

To deal with limitations of the trial first. It might, with some reason, be argued that a period of four weeks was not sufficiently long to ensure that the full potential and optimal effects of chlorpromazine would become operative in each case. Again, it might be contended that the upper dosage level of chlorpromazine which was adopted, namely 150 mg. daily, was less than that which might have been required to achieve an effective biochemical reaction in every one of the trial patients. However, these objections might, to some extent at least, be discredited by the clinical findings of Elkes and Elkes (3) "that high dosages led to undesirable side-effects, and ultimately 150 mg. (two tablets t.d.s.) was found to be both safe and (in those cases in which response was noted) effective", with improvement manifesting itself "after three to six weeks". Furthermore, valid statements may be made about the therapeutic performance of chlorpromazine within the specified qualifications which were implicit in the design of the trial. The results are inevitably relative to the patient material; the nature of the observations recorded; the treatments which were used and contrasted; the various dose levels, and length of time for which they were administered. To determine the effects of a variation of any one, or more, of these factors would necessitate a new and different investigation.

The "blindness" of the trial was effectively preserved throughout. Neither pallor nor Parkinsonian symptoms emerged as identifiable characteristics of chlorpromazine. Three patients complained of "sleepiness" during the daytime, later found to be associated with chlorpromazine in two instances, and with B.W.203 in the third. The patient who complained of sore throat was immediately withdrawn from the trial because of her physically ill condition. Her neutrophil count was found, subsequently to be 48 per cent., and the drug she had been receiving was chlorpromazine. As she had been treated some time previously with a phenothiazine compound, it may be that she had become "sensitized" to chlorpromazine. Fatal cases of agranulocytosis due to phenothiazine compounds have been reported in the literature from time to time. Earle (2) in reporting upon a fatal case, due to promazine hydrochloride, concluded that "Since the dosage given was small, acute sensitization to the drug must be assumed". Feldman *et al.* (4) in commenting upon a fatal case of agranulocytosis during treatment with Pacatal, had the following to say: "Routine blood studies (monthly) were not effective in detecting the presence of agranulocytosis prior to the onset of the full-blown clinical picture. Such infrequent laboratory studies may be detrimental to the extent that they may lull the clinician into a false sense of security regarding this dreaded complication. If it is not feasible to consider routine blood studies as often as twice weekly (or oftener), such studies at infrequent intervals are of doubtful value". They emphasize the importance of the clinical aspects of a course of treatment with "less reliance upon infrequent laboratory data", and advocate that patients who exhibit any or all of the triad of symptoms, fever of undetermined origin, sore throat, or lesions of mucous membranes, "should be considered and treated as cases of agranulocytosis until proven otherwise". Immediate withdrawal of the drug at the slightest clinical or haematological suggestion of bone-marrow depression may well be the wisest course of action when using such drugs. To keep the patient on the compound whilst repeated white cell counts are carried out may render one wise when it is too late to alter the event.

There are certain inherent difficulties in a trial of this nature. When sets of patients have been devised in advance for different sequences of treatment, the withdrawal of a patient from the trial, for any reason, inevitably upsets the balance of the sets for the purposes of comparison. A further problem is that of resisting demands, from whatever source, for the administration of one of the physical methods of treatment to a trial patient who may have become more disturbed in his behaviour during the course of the investigation. A considerable degree of tact and vigilance are required if the trial, as a whole, is to be brought to a reasonably successful conclusion.

The therapeutic results are illuminating in many respects. The rating scale mean improvement scores for the 34 patients who received all three preparations consecutively were higher for the placebo than for either chlorpromazine or B.W.203, without, however, the results reaching statistical significance. A considerable number of "improvement" assessments were recorded for all three treatments, and those for the placebo exceeded the number recorded for either of the two "active" preparations. The differences between all of the recorded weekly global assessments just reached significance at the 5 per cent. level of confidence, and a glance at the relevant table would suggest that the major difference was as between the placebo and B.W.203, with chlorpromazine taking an intermediate position in the results. (A similar relationship may be seen to obtain for the 3 treatments in respect of the rating scale mean improvement scores.) When direct comparisons are made, and statistically analysed, between any one preparation and either of the remaining two, the impression is confirmed that the major difference was between placebo and B.W.203, with the difference being significant at better than the 5 per cent. level of confidence ($P=0 \cdot 02$). This difference would seem to be a function of two separate factors: (*i*) the smaller number of improvement responses associated with B.W.203 as compared with the placebo; (*ii*) the greater number of deterioration responses associated with B.W.203 as compared with the placebo.

The most tenable interpretation of the results is, that although B.W.203 was associated with some therapeutic success in terms of improvement scores and clinical assessments, this was not due to any specific and beneficial effect of the drug, which may on the contrary have been exerting deleterious effects and so diminishing the overall potential "placebo" effect of the trial situation. Examination of individual patient responses, in retrospect, to some extent confirms this hypothesis, in that a small number of patients manifested an acute exacerbation of their psychotic symptoms during the period in which they were receiving B.W.203. Indeed, as may be seen from Table IV, all four of the patients who were consistently worse throughout a four-week period, were receiving B.W.203 at the coincidental time, and the differences between the three preparations in this respect is significant at the 5 per cent. level of confidence.

Each of the three treatments was associated with a positive mean improvement score, in terms of the rating scale, and likewise with a certain percentage of consistent improvement as expressed in global assessments. In the latter respect the placebo was associated with, approximately, a 30 per cent. improvement rate, whilst that for both chlorpromazine and B.W.203 was in excess of 20 per cent. This would seem to imply that the response of the patients, therapeutically, was a function of the investigation and investigators rather than the treatments themselves. On the other hand, consistent deterioration, in the small number of patients in which it may occur, would seem to be a direct function of a specific and undesirable effect of the preparation concerned. From this trial it may be reasonably deduced that a 20 per cent. improvement rate, in itself, is little or no criterion of the value of a drug unless the placebo response is seen to be significantly less than this. Furthermore, paradoxically, a 20 per cent. improvement rate may mask the positively detrimental effects of a compound such as B.W.203.

The therapeutic performance of chlorpromazine, in this trial, suggests that it was acting in a non-specific way. It was certainly not superior to the placebo which was used as a control. This would seem to confirm the negative results of Mitchell (6) who reported that, in a controlled experiment, using objective criteria of behaviour incidents, "chlorpromazine, even in a dosage of 300 mg. daily, made no significant difference in the aggressive psychomotor behaviour of chronic schizophrenic patients". On the debit side of its account, in our trial, must be weighed the single instance of polymorphonuclear leucopenia which was encountered. The "sleepiness" of which two chlorpromazine patients complained was so analogous to that of any sedative or hypnotic, e.g. a barbiturate, that one wonders how realistic, at the present time, is the qualitative differentiation which tends to be made between the so-called tranquillizers and the traditional group of sedatives and hypnotics.

The imperative need for placebo control in evaluating the effects of drugs which may be used in the psychiatric field has, once again, been illustrated.

SUMMARY

A blind "self" controlled comparative trial of 3 preparations, B.W.203, chlorpromazine, and a placebo, in the treatment of psychosis has been reported upon. Thirty-four in-patients received the three different treatments consecutively and in graded dosage for a period of four

weeks for each treatment. The therapeutic response of each patient was measured in terms of rating-scale scores and weekly clinical or global assessments. The design of the trial was such that direct comparisons might be made between the therapeutic performance of each of the three methods of treatment and to enable some judgments to be formed as to whether any one of the six possible sequences of administration was more effective than the others, and whether the response in any one of the three main wards was significantly greater than its counterparts.

Each of the three methods of treatment was associated with some degree of positive therapeutic success in terms of both the rating scale scores and global assessments. The mean improvement scores associated with the placebo exceeded that for either chlorpromazine or B.W.203, without the differences, however, being statistically significant. The differences between the effects of the three treatments in terms of global assessments were significant at the ·5 per cent. level of confidence; and the difference between the placebo and B.W.203 was significant at the 2 per cent. level. Each treatment was associated with a consistent improvement rate, in global terms; 29 per cent., 24 per cent., and 21 per cent. for placebo, chlorpromazine, and B.W.203 respectively, without the differences being statistically significant. Of the three treatments, B.W.203 was the only one associated with consistent deterioration, and the proportion, in this respect, for this preparation was 12 per cent. and significant at the 5 per cent. level of confidence.

It is deduced, therefore, that in terms of the clinical assessments made upon the 34 psychotic in-patients included in this trial, and for the respective dosages and duration of administration of the three treatments applied, the placebo was superior in therapeutic effects to compound B.W.203, and that the effects of chlorpromazine ranged somewhere between the former and the latter, without, statistically speaking, differing significantly from either. A small but significant consistent deterioration rate was identified with the administration of B.W.203, but not with either the placebo or chlorpromazine.

From the results of the trial as a whole, it is concluded that there is a definite need for the disciplined evaluation of new, and perhaps already established drugs which may be used in the field of psychiatry.

Acknowledgments

We are indebted to the Wellcome Foundation Ltd., for generously sponsoring this piece of research. We are grateful to Dr. A. M. Spencer for providing the inspiration without which the work would not have been undertaken, and for permission for publication. We would like to thank Mrs. J. Randle for her diligent dispensing; the nursing staff for their conscientious co-operation; and, finally, Mrs. E. J. Sherwood for secretarial assistance.

References

1. Delay, J., and Deniker, P., *Thérapie*, 1953, **8**, 347.
2. Earle, B. V., *Lancet*, 1957, *ii*, 925.
3. Elkes, J., and Elkes, C., *Brit. Med. J.*, 1954, *ii*, 560.
4. Feldman, P. E., Bertone, J., and Panthel, H., *Amer. J. Psychiat.*, 1957, **113**, 842.
5. Hamon, J., Paraire, J., and Velluz, F., *Ann. med.-psychol.*, 1952, **110**, 331.
6. Mitchell, P. H., *J. Ment. Sci.*, 1956, **102**, 151.

THE RELATIONSHIP BETWEEN PRENATAL PORENCEPHALY AND THE ENCEPHALOMALACIAS OF EARLY LIFE

By

R. M. NORMAN

H. URICH

and

GRACE E. WOODS

From the Burden Neuropathological Laboratory, Frenchay Hospital, Bristol and the Department of Child Health, Bristol University

In the course of time the term "porencephaly" has come to mean a condition characterized by any large circumscribed defect in the substance of the brain. Because of the unmyelinated state of the centrum semiovale in early life traumatic, vascular, anoxic or infective processes are likely to lead to a much more massive resorption of the tissues than occurs in the adult. Parts of the wall of the hemisphere may be converted into a semi-translucent membrane separating the lateral ventricle from the sub-arachnoid space. This thin sheet of neuroglial tissue usually represents the residual stretched out molecular layer of the cortex, and is a finding common to many varieties of infantile and foetal encephalomalacia (Wolf and Cowan, 1956).

Such a severe degree of cortical atrophy is never found in uncomplicated internal hydrocephalus though purely membranous areas of relatively limited extent may be derived from herniated sub-ependymal tissues (Russell, 1949). Encephalomalacic destruction of the brain is maximal in the extraordinary condition called hydranencephaly (Spielmeyer, 1905) in which the greater part or even the whole of the cerebral hemispheres is converted into thin sacs. In extreme instances the diencephalon, upper midbrain or cerebellum may be involved. Most of such cases are thought to have originated during the second half of foetal life. In Lange-Cosack's (1944) well described cases it was evident that these gross anomalies were the consequence of destruction and not of a primary failure of development. The membranous parts of the brain could be restored to their normal contours by suitable packing or inflation and there were residual signs of a pathological process, particularly in the presence in the meninges and underlying membrane of numerous macrophages containing iron pigment.

Just as there are striking points of resemblance between hydranencephaly and multiple cystic encephalomalacia arising in the paranatal period so there is a close morphological affinity between hydranencephaly and those porencephalies originating at a still earlier stage in foetal development (Peters, 1951). It must, however, be admitted that the pathogenetic evaluation of these early cases is difficult on account of the associated distortions of morphogenesis, the inability of the foetal neuroglia to react to noxae and the possibility that there may be fortuitous changes brought about by later degeneration or by birth injury.

These difficulties in interpretation were clearly recognized by Yakovlev and Wadsworth (1946) who drew a pathogenetic distinction between "encephaloclastic" processes and "agenesis" by which term they understood "an inhibition of the growth and differentiation of the medullary tube". Yakovlev and Wadsworth gave a detailed description of two superficially very different forms of cerebral defect, both of which they ascribed primarily to localized agenesis of the wall of the telencephalon. In the first type of malformation symmetrical clefts with fused borders and rolled-in lips of polymicrogyric cortex lay in the position normally occupied by a main fissure. This cleft formation was named "schizencephaly" in order to avoid the term porencephaly which is "laden with pathogenetic implications of circulatory disturbances and encephalomalacic processes". In the second variety of maldevelopment very large parts of the wall of the hemispheres had been involved. The entire frontal, parietal and insular regions were represented by a semitransparent membrane which lay beneath the leptomeninges. The normal contour of such brains had been approximately maintained by a thin sagittally placed arch of neural tissue, identified as a hypertrophied supracallosal rudiment, passing like the handle of a basket above the preserved basal parts of the brain.

In the present case of bilateral porencephaly large defects in the hemispheres were also filled in by membrane and a handle-like arch of neural tissue was also present. Although there were many similarities in structural detail between this specimen and those described by Yakovlev and Wadsworth, there were also notable differences particularly in the finding of unequivocal traces of a pathological process linking the condition to hydranencephaly. Transitional cases of this sort have seldom been fully described and may throw further light upon the formal pathogenesis of malformations in the early developmental period.

Case Report

C.L., a female, aged at death 2 years 7 months, was the third child of young Polish parents. The first child had been stillborn and the second now aged 5 years is normal. The mother had a haemorrhage at the first missed period and gave a history of a copious and offensive vaginal discharge associated with lower abdominal pain, apparently similar to that experienced by her during an attack of acute salpingitis some years previously. These symptoms cleared up during the fourth month of pregnancy. She affirmed that no attempt had been made to interfere with the pregnancy. Her blood group was O Rh.+ve and the Kahn test was negative.

The baby was born at home after a 36-week gestation period. The labour lasted six hours, presentation was R.O.P. and the birth weight 5 pounds. The circumference of the head was 12½ inches.

Respiration commenced immediately, but excessive mucus necessitated suction and the administration of oxygen. For several hours the respirations were grunting and accompanied by a marked recession of the ribs. She was admitted to a Premature Baby Unit and placed in an oxygen tent and streptomycin 50 mg. and synkavit 10 mg. were given immediately and continued for five days. The fontanelle was normal.

Jaundice developed on the third day and became severe by the sixth. The child fed slowly but there was no neurological evidence of kernicterus. At 18 days she was discharged fully breast fed.

She was seen at a follow-up clinic several times before eight months of age. At six months she was sent into hospital by her family doctor for a respiratory infection. No mental retardation had yet been noted. At 1 year 11 months she was first seen by the Cerebral Palsy Assessment Team in Bristol. She was then microcephalic and showed the defective movement pattern typical of severe spasticity. In the supine posture the arms were abducted, the forearms raised and the legs adducted, this position being maintained by spasm. When placed prone the position of the limbs changed to one of flexion. Well marked tonic neck reflexes were present. The eyegrounds were normal but vision was defective and she did not follow a moving object in the right field of vision. Hearing appeared to be normal but speech was limited to babbling noises. On the Griffiths Scale she recorded a general quotient of 12·5. [A (Locomotor) 18·75; B (Personal-Social) 18·75; C (Hearing-Speech) 18·75; D (Hand-Eye) 4·7; E (Performance) 2.] This result corresponded to a developmental age of 13 weeks. She was able to score on some of the simpler tests of reflex locomotor activity and responses to sounds but was severely handicapped in tasks involving purposive movements and vision.

She received physiotherapy for six months and the tendency to adduction of the legs improved but flexor contracture of the knees could not be prevented.

At the age of $2\frac{1}{2}$ years she was admitted to hospital with a history of pyrexia, listlessness, vomiting and diarrhoea for the past two days. She had had three convulsions before admission. On examination there were dullness and crepitations at the right base. Kernig's sign was positive. There was strabismus of the right eye. Pupils and cranial nerves were normal. The tendon reflexes were equal and muscle tone increased. The plantar responses were flexor. The C.S.F. was normal.

She died five days later from bronchopneumonia.

Post-mortem. There was no visceral malformation. On removing the calvaria and dura the cerebral hemispheres were found to consist largely of thin distended sacs containing clear fluid under pressure. The falx and superior longitudinal sinus were present and there was no external hydrocephalus.

EXAMINATION OF THE CENTRAL NERVOUS SYSTEM

Macroscopic Appearances

The fixed brain weighed 271 g., the cerebellum and brain stem accounting for 150 g. The shape of the brain resembled a basket the base of which consisted of the occipital and temporal lobes and the basal ganglia, while a semicircular "handle" extended from the interhemispheric fissure between the occipital lobes to the anterior part of the striate bodies (Fig. 1). The large defects between the "handle" and the remaining cerebral cortex on either side were covered by a thin semi-translucent membrane. The defects were not strictly symmetrical and more cortex remained on the right side than on the left. The *right* temporal lobe was intact, the pole and the three temporal convolutions being normally constituted. A short Sylvian fissure separated the superior temporal gyrus from a remnant of the lower parietal cortex which consisted of two broad, strap-like gyri arranged vertically. The parieto-occipital region also showed an abnormal convolutional pattern with broad, irregular gyri arranged along two vertical fissures. The medial surface of the occipital lobe contained a well-developed

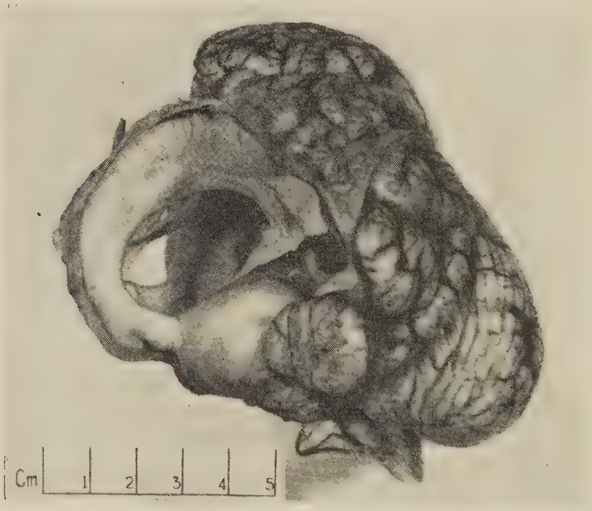


FIG. 1.—Lateral aspect of brain. The membrane has been detached revealing the common ventricle. The arch of the cingulate gyrus ("handle") is seen joining the prominent mass of the corpus striatum.

calcarine fissure. The convolutional pattern of the base of the temporal and occipital lobes was normal and the total length from the temporal to the occipital pole was 9½ cm. The frontal lobe was represented only by a small remnant of the orbital surface about ½ cm. long.

On the *left* side the temporal lobe showed gross structural anomalies and the distance from its anterior end to the occipital pole was 6 cm. On the convexity the inferior temporal gyrus was present only in its posterior half. The middle temporal gyrus was represented by a small fragment near the posterior end, while anteriorly it was replaced by a button-like plaque. On the inferior surface the hippocampal formation was well developed and more prominent than on the right. The fusiform and lingual gyri were identified. The parietal lobe was absent. The occipital lobe was deeply indented by a prominent vertical sulcus which extended to the inferior surface and the calcarine fissure was not identified.

The lateral ventricles were grossly dilated and occupied the entire space between the base of the "basket" and the membrane, communicating with each other through the large orifice between the concavity of the "handle" and the base. There was no corpus callosum. The floor of the ventricular cavity was formed by the prominent paired eminences of the basal ganglia, the anterior striatal portion being larger than the posterior mass of the thalamus. The choroid plexuses were in their normal position.

The olfactory bulbs and tracts were not found in the specimen. The optic nerves and chiasma were present, but the left optic tract was missing. The other cranial nerves appeared normal.

The brain stem showed no abnormality except for a reduction in size of the cerebral peduncles and the medullary pyramids. The cerebellum appeared normal.

The arteries of the circle of Willis were identified, but were abnormally small with the exception of the posterior cerebral arteries which were normally developed.

Histology

The cerebrum was divided into four blocks which were embedded in celloidin and cut serially in the longitudinal axis of the brain stem, every fortieth section being stained with carbol azure and the adjoining one with Heidenhain's method for myelin. In addition selected sections were stained with Holzer's method and Mallory's P.T.A.H. stain for fibrillary glia. Representative sections were taken from the brain stem and cerebellum.

Cerebral cortex: In the *right* temporal pole both the isocortex and the allocortex of the uncus showed a normal configuration and cytoarchitectural pattern. Further back micropolygyria ("true microgyria") began to appear, first in the superior, then in the middle and finally also the inferior temporal gyri, while Ammon's horn, the hippocampal gyrus and the fusiform gyrus remained normal. In the occipital cortex, the medial surface was normal, while the inferior, lateral and superior surface were micropolygyric (Fig. 3). Towards the occipital pole the malformed cortex gradually receded and remained in view only on the lateral surface. The striate cortex was well developed and at its anterior end covered an abnormally wide part of the medial surface instead of being concealed in the calcarine fissure (Fig. 2). On either side the roof of the posterior horn showed a conspicuous break in the continuity of the cortical grey matter (Fig. 3). these gaps being occupied by a broad seam of dense

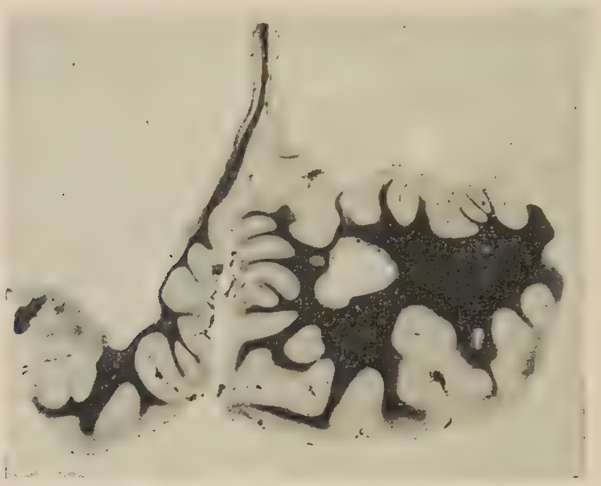


FIG. 2.—The posterior part of the "handle" passes on both sides into the occipital lobes. Note the absence of the stria of Gennari on the left and the extensive distribution of the striate cortex on the right medial surface. Heidenhain's myelin stain ×1.

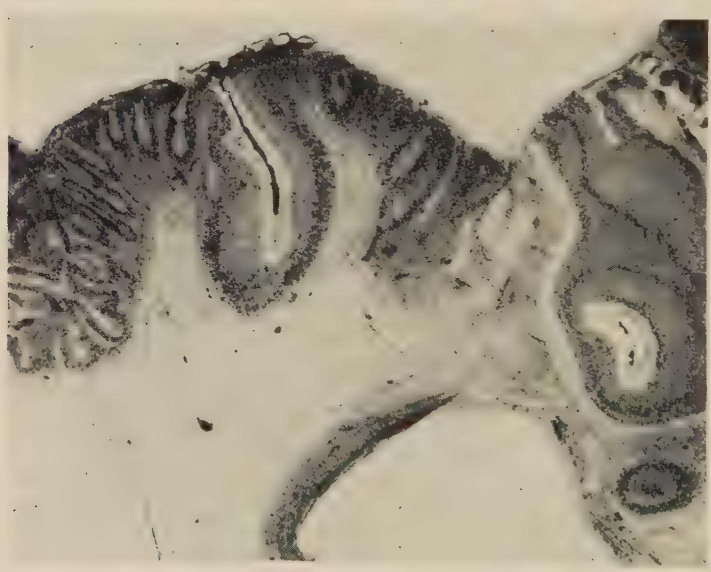


FIG. 3.—Right occipital lobe showing micropolygyria and a break in the continuity of the nerve cell layers in the roof of the posterior horn. Carbol azure ×4½.

fibrillary neuroglia (Fig. 4) merging with the layer of neuroglia forming the lining of the ventricle. Numerous small calcifications and glial nodules were scattered throughout these areas. The subcortical white matter of the occipital lobe was well myelinated throughout, but showed gliosis. Two bundles of fibres stood out by their dense myelination: the optic radiation and the fasciculus longitudinalis inferior. These tracts were not identifiable on the left side.

The cortex above the Sylvian fissure was entirely micropolygyric and no parietal operculum was present. Near the edge of the defect the malformed cortex had rolled inwards to form part of the floor of the porus. The structure

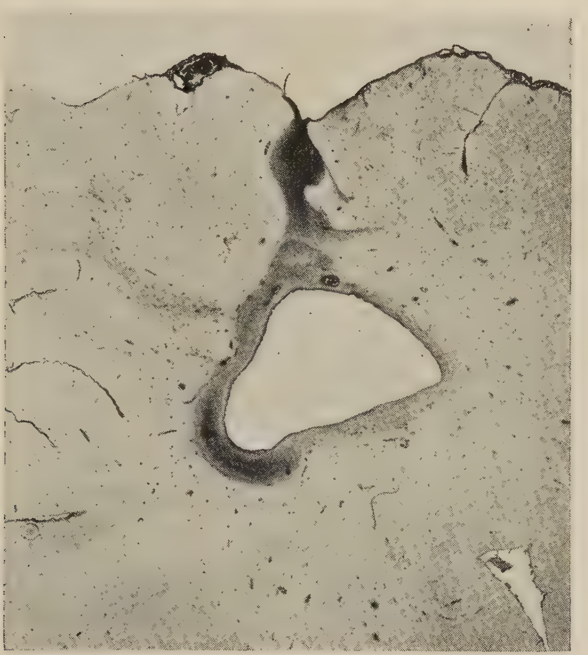


FIG. 4.—As in Fig. 3 showing the fibrillary gliosis in the areas of cortical destruction and the periventricular gliosis. Holzer ×3.

of this micropolygyric cortex varied considerably from place to place, but was always of the "internal" type without the formation of sulci. In some places it showed the typical four layer pattern, the acellular third layer sometimes being continued into the mid-zone of an otherwise normally differentiated gyrus.

On the *left* side only the allocortex of the uncus could be identified in the anterior part of the temporal lobe. It was flattened out and occupied the inferior surface of the cortical fragment. Further back, only the hippocampal and fusiform gyri showed a normal structure and Ammon's horn had failed to "roll in" completely so that the hilum of the dentate fascia pointed medially instead of dorsally. The occipital lobe was much smaller on the left side because of its greater participation in the porencephalic cavity. Peculiar structural modifications of the visual cortex were present in the form of a granular fourth layer without a stria of Gennari or stellate cells and a fifth layer without the giant cells of Meynert (Fig. 2).

Structure of the "handle": Shortly after emerging from its connection to the region of the anterior commissure this roughly circular mass of tissue was seen to be partially divided by a dorsal cleft lined by leptomeninges. The two eminences so formed were covered by a continuous layer of agranular cortex (Fig. 5a). This was recognizable on one side as appropriate to the cingulate gyrus on account of the conspicuous fifth layer of large pyramidal cells. Two well-defined circular bundles of myelinated nerve fibres (? stria of Lancisi) were present on either side in the deeper part of the walls of the fissure. The myelinated central cores of these two gyri joined together across the midline (Fig. 5b). Below this myelinated zone lay a broad area showing numerous neuroglial nuclei, glial nodules and ill-defined clusters of nerve cells. The membranous covering of the large cerebral defects took origin from the dorsal surface of the two gyri. Two large centrally placed arteries were contained in the folds of membrane (? anterior cerebral arteries). Posteriorly the "handle" merged on either side with the superio-medial border of the occipital lobe (Fig. 2). At this level it consisted of two parts separated from each other by two layers of leptomeninges. The right part was membranous, heavily gliosed and contained no nerve cells (Fig. 6). The left and larger portion contained well-developed strips of cortex and myelinated subcortical fibres. Two types of cortical architecture were seen in the various sections, one an isocortex with a granular layer consistent with the posterior part of the cingulate formation, the other an agranular strip of pyramidal cells which may have represented the retrosplenial cortex.

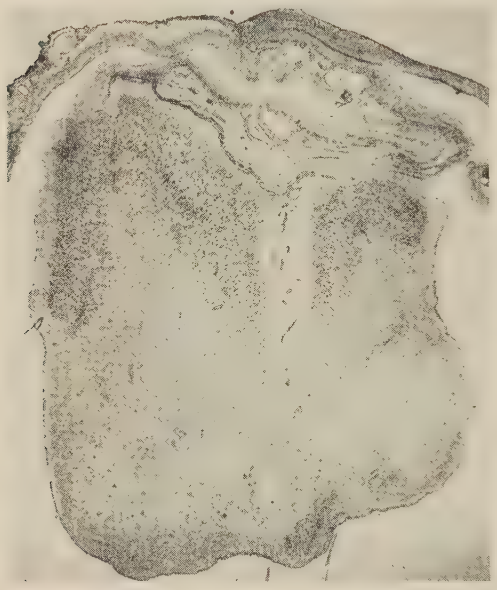


FIG. 5a.—Structure of the anterior part of the "handle" (cingulate gyrus) with dorsal attachments of the membrane. Carbol azure ×9.

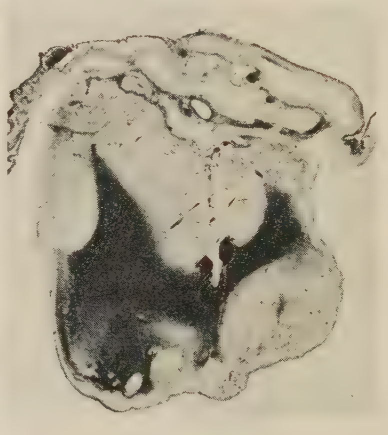


FIG. 5b.—As in 5a. Note the two small myelinated bundles on either side of the dorsal fissure. Heidenhain ×6.

The membrane was also attached to the borders of the cerebral remnants. The basal attachments were as a rule not at the inner edge of the involved cortex, but at a point lateral to it. Near its attachments the membrane sometimes contained islands of nerve cells or was composed of a thin strip of grey matter with scanty subcortical myelinated fibres. However, in its greatest extent the membrane was formed only by a thin layer of neuroglial tissue lying beneath the pia-arachnoid. Its ventricular surface was smooth and devoid of connective tissue.

Basal ganglia: The anterior limb of the internal capsule was poorly developed and largely failed to separate the caudate nucleus from the putamen. The tail of the caudate was only identified on the right side. The striate bodies appeared massive for so small a brain and measurement showed them to be fully equal in extent to those of a normal adult (Fig. 8). Their histological structure was normal. The right claustrum was also relatively large and well preserved except at its upper end near the floor of the ventricle where it was replaced by gliosis and calcifications. On the left side the claustrum formed the

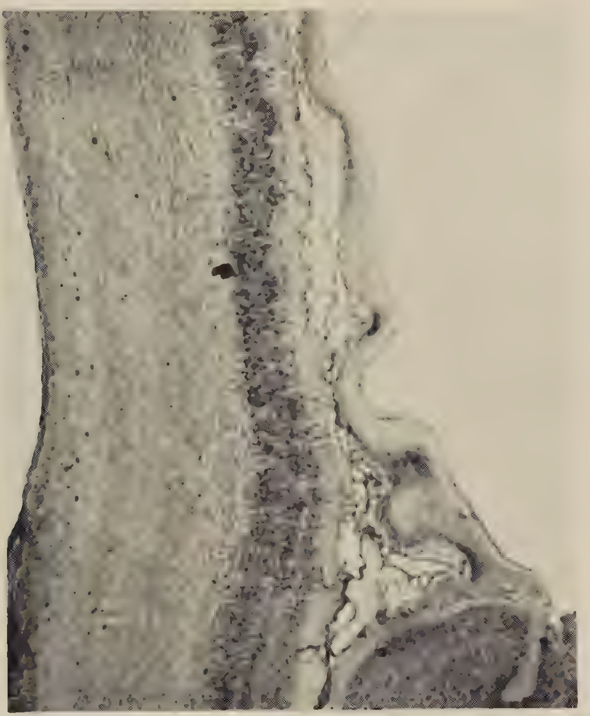


FIG. 6.—Showing the double structure of the posterior part of the "handle"—cortical grey matter on the left, membrane on the right. Carbol azure ×9.

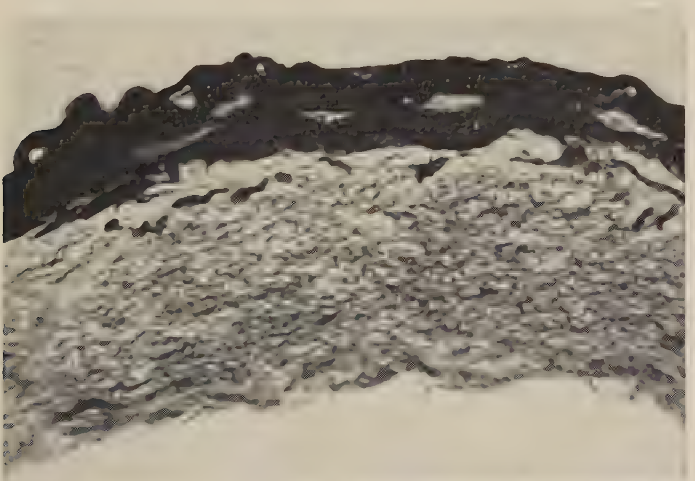


FIG. 7.—A gliotic part of the membrane lying beneath thickened leptomeninges. Holzer ×240.

wall of the porus and was severely damaged, showing in places dense gliosis and much calcified debris in which short lengths of fibres and closely packed spindle shaped cells could be distinguished (Fig. 9). The external capsule was present on both sides, but was thinner on the left, while the extreme capsule was present only on the right side. Each globus pallidus showed normal cyto- and myelo-architecture. The amygdaloid nuclei and the nuclei basales also

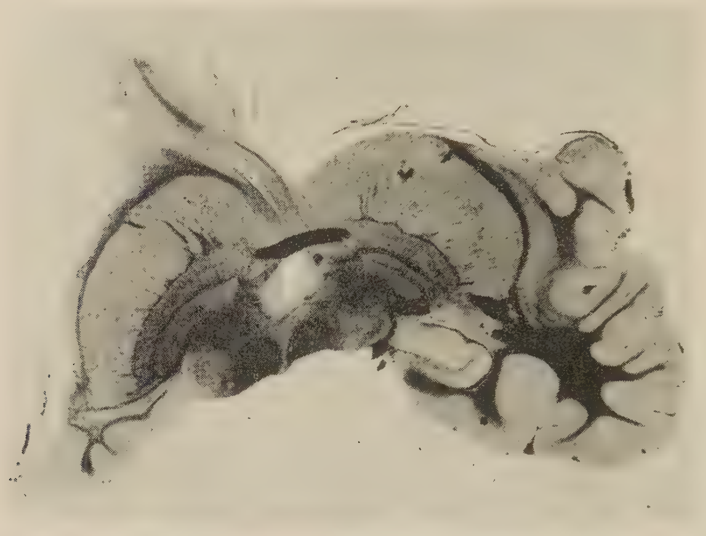


FIG. 8.—Section through the anterior commissure showing the anterior part of the "handle" above. The left claustrum is partially destroyed and both striate bodies are hyperplastic. Part of the membrane is seen on the right collapsed on the floor of the common ventricle. Note the absence of the left optic tract. Heidenhain ×1½.

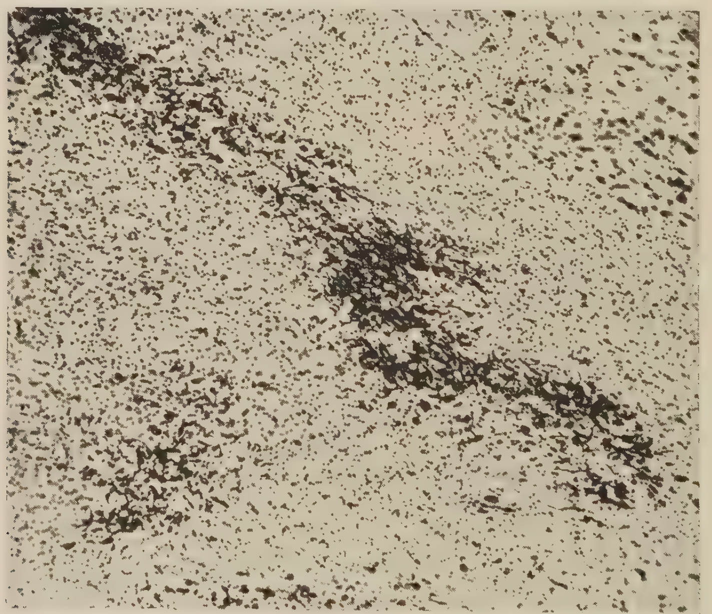


FIG. 9.—Calcified neurones and debris in an area of gliosis in the left claustrum. The normal cells of the striatum appear at the top right hand corner. Carbol azure ×80.

appeared normal on both sides. The anterior commissure was well myelinated.

The thalamus was better developed on the right side than on the left. Both were smaller than normal, but there was no gliosis. On the right all the main nuclear masses could be identified, on the left side the pattern was distorted and the individual nuclei difficult to identify. The main mass of the thalamic radiations appeared to terminate in the striatum (Fig. 10). Myelination was normal and the taenia medullaris, the posterior and habenular commissures, the habenulo-interpeduncular tract and the tract of Vicq d'Azyr were easily identifiable. The bodies of Luys and the fields of Forel appeared normal. The left lateral geniculate body was absent and its site marked by a conspicuous mass of neuroglial cells (Fig. 11). The left medial geniculate body was smaller and contained fewer nerve cells than the right. The hypothalamus, tuber and infundi-

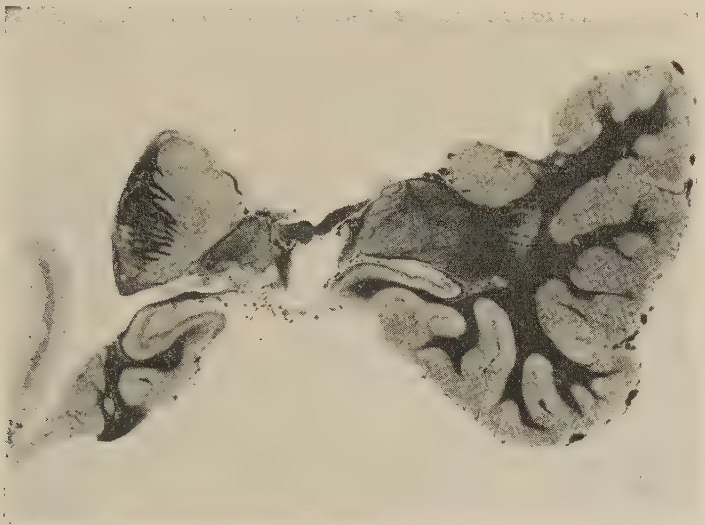


FIG. 10.—Section through the thalami. Note the dense thalamic radiations in the left striatum. Heidenhain ×1.

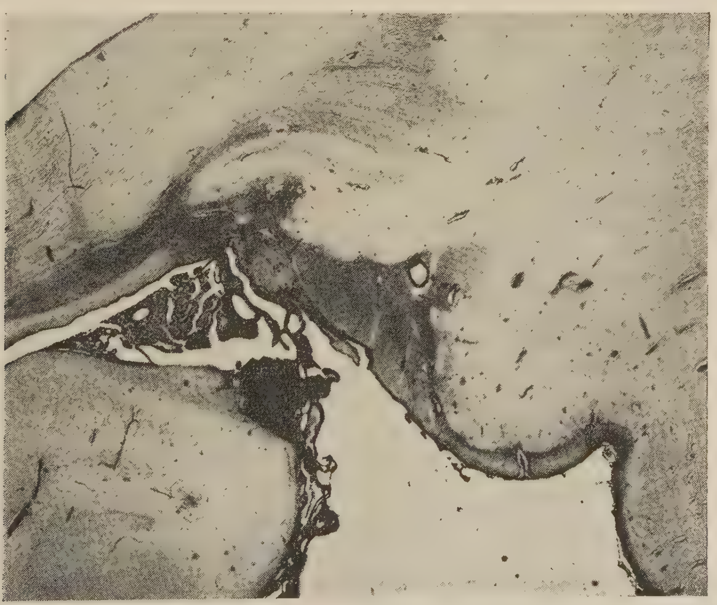


FIG. 11.—Showing the fibrillary gliosis present in the atrophied external geniculate body. A small remnant of the optic tract is also seen on the left. Holzer ×7½.

bulum were normal. The supraoptic commissure was well myelinated. The fornix was well developed throughout its course and the transverse fibres of the hippocampal commissure were also identifiable. The optic chiasma consisted entirely of fibres crossing from the left optic nerve towards the right optic tract. No fibres could be seen crossing in the opposite direction and the left optic tract was absent (Fig. 12), except for a small gliosed remnant as it approached the atrophied lateral geniculate body. A large optic radiation and a well-developed temporo-pontine tract was present on the right side.

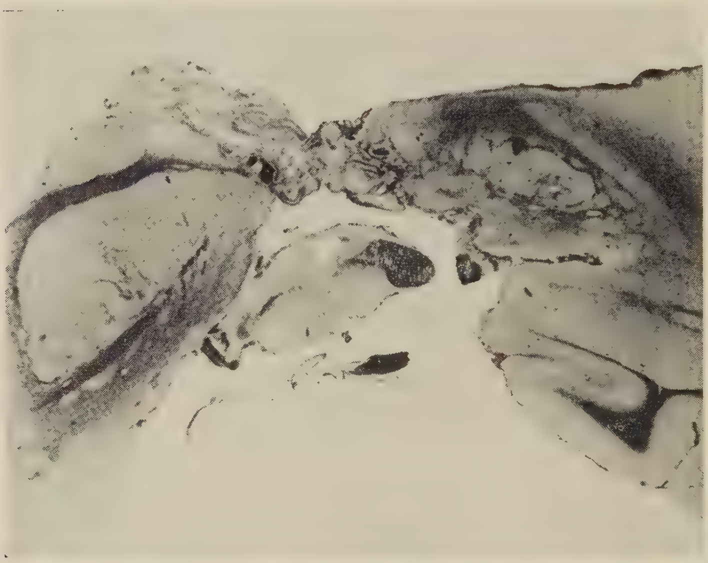


FIG. 12.—Section through the pre-optic recess with the right optic tract in its lateral wall. The left optic tract is absent. The third cranial nerve lies free below. The other dark staining bodies attached to the surface of the brain are blood vessels. Heidenhain ×1

Brain stem: In the midbrain the right cerebral peduncle was fairly well developed in its lateral part but narrowed medially where it showed fibrous gliosis. On the left side the peduncle was represented only by a thin layer of dense fibrillary glia. The red nuclei, the substantia nigra, the nuclei pontis and the tegmental structures were intact. The medial fillet and the transverse ponto-cerebellar fibres showed fibrillary gliosis and cortico-pontine bundles were present only on the right side. In the medulla the left pyramid was absent while the right contained only a few fibres.

Cerebellum: Widespread, patchy, lesions compatible with the effects of a recent epileptic fit were found in the anterodorsal parts of the cerebellar hemispheres and of the vermis. Many Purkinje cells were absent or showed severe chomatolysis but the most striking feature of the affected areas was the presence of numerous microglial "shrubberies" in the molecular layer. Fibrillary gliosis was present in the central cores of the more affected folia and in the white matter of the dentate nuclei.

Ventricular system: The large central ventricular cavity was denuded of ependyma and lined with a thick layer of neuroglia. Here and there the glial nuclei were condensed into little nodules. In the depth of the periventricular glial layer ependymal tubules and rosettes could be seen, and there were numerous small foci of calcification. The posterior extremity of the common ventricle narrowed on either side to join the small posterior horns which terminated in a line of fusion consisting of neuroglial cells and ependymal rosettes. A similar line of fusion representing an obliterated anterior horn could be seen between the head of the left striatum and the anterior part of the handle. The third and fourth ventricles and the aqueduct showed patchy granular ependymitis.

The epithelium of the choroid plexuses showed scanty mineral incrustations.

Meninges: There was slight leptomeningeal thickening over parts of the membrane. The pial arteries appeared normal. Here and there abnormally numerous dilated veins were seen over the microgyric cortex.

DISCUSSION

The histological findings in this case have several features in common with those reported by Lange-Cosack in hydranencephaly. The structure of the roofing membrane and its continuity with the outer zone of the preserved parts of the cortex are similar in both conditions. As in many cases of hydranencephaly residual traces of a pathological process were to be found in the widespread "ependymitis" and periventricular calcification. The conspicuous aggregations of calcified cells and debris found in the damaged parts of the claustrum are also suggestive of a pathological process having occurred during foetal life since formations of this peculiar character with closely approximated bipolar cells are not, in our experience, seen in lesions of the paranatal period. Complete disappearance of the olfactory tracts and of parts of the visual pathways are also features of hydranencephaly and the absence of one optic tract has been reported by Obersteiner (1902) in a case of double porencephaly very similar to ours. That this phenomenon may be the result of destruction rather than of developmental failure is well shown in Lange-Cosack's first case in which the optic pathways were absent except for remnants found in the orbits. In her case, also, the calcarine cortex could not be identified, just as in ours the stria of Gennari was lacking on the side of the missing optic tract. Such secondary cortical malformations following total interruption of the optic radiation in foetal life are evidently more severe than those comparatively minor changes induced by congenital blindness due to faulty development or early disease of the eyes (Tsang, 1937).

The changes found in the roof of the posterior horn in our case provide an interesting contrast to the cleft formations described in this position by Yakovlev and Wadsworth in some of their brains with large membranous defects. In these cases the clefts were formed by the fused borders of rolled-in cortex which reached the ependymal layer and were continuous with subependymal heterotopic collections of nerve cells. These malformations were considered to have originated before the second month at a time prior to the segregation of the three layers of His. It was this finding of clefts similar in structure to those of uncomplicated schizencephaly which influenced these authors in their conviction that the large membranous defects in the hemispheres had been produced by a separation of the lips of pre-existing clefts and a stretching of the intervening agenetic tissue. In our case, on the other hand, the cortical ribbon had been interrupted by a broad wedge-like seam of dense fibrillary gliosis containing small calcifications. This defect was present in the roof of each posterior horn where it formed the margin of the porencephalic cavity and we interpret this finding as indicating that an area of incomplete necrosis adjoined the larger region of more severe encephalomalacia.

The presence of micropolygyria ("true microgyria") in the neighbourhood of the porencephaly dates the onset of the pathological process as having occurred before the fifth month of intra-uterine life, that is, before cell migration had ceased or lamination of the cortex become apparent. In our case the thalamic projection fibres normally destined for the frontal and parietal lobes ended in the striatum. These outgrowing fibres begin to be recognizable at about the middle of the second month and reach their major development during the fourth month when the intermediate layer of the telencephalic wall rapidly thickens. Since the thalami showed no evidence of retrograde nerve cell atrophy, except perhaps in so far as they were of small size and their nuclei poorly differentiated, it seems likely that the destruction of the hemispheres had occurred at some time during the third month. This time of onset would also account for the complete absence of the corpus callosum. The majority of cases of hydranencephaly, on the other hand, originate in the latter half of foetal life (Lange-Cosack) and the thalami were severely atrophied in Edinger and Fischer's (1913) specimen, in which the lesions were considered to have occurred at the sixth month.

A further difference from hydranencephaly is seen in the preservation of an arch of sagittally placed neural tissue forming the superior border of the "porus". In our case this appeared to be the remnants of the cingulate gyrus. In Cohn and Neumann's (1946) specimen more substantial parts of the cortex were preserved on each side and callosal fibres could be recognized. In Yakovlev and Wadsworth's cases the handle-like structure was identified as the hypertrophied supracallosal rudiment of the hippocampus.

The distinction between prenatal porencephaly and hydranencephaly thus appears to be due mainly to differences in the extent of the cerebral damage and the time of its onset. The earlier the onset in foetal life the more obvious will be the secondary maldevelopments and the less evident will be the signs of reaction on the part of the tissues to the destructive process. The work of experimental teratologists has shown how intimately interwoven are the processes of resorption of neural tissue and its repair (Hicks, 1954). These considerations make one wonder whether the antithesis set up by Yakovlev and Wadsworth between schizencephaly and "encephaloclastic" porencephaly is as sharp as they would make out. The solution of this problem cannot be approached until more is known of the mysterious aetiological factors concerned with the destruction of foetal tissues. It is known that bladder-like brains closely resembling hydranencephaly can be produced by arterial obstruction in the human infant (Smith, *et al.*, 1957) or in the experimental animal (Becker, 1949), but lesions mainly confined to the distribution of the internal carotid blood supply have been found only in a proportion of the cases of prenatal hydranencephaly. Foetal anoxia, most clearly exemplified in the cases of attempted suicide in pregnant women by CO inhalation, can cause both extensive softening of the centrum semiovale (Neuburger, 1935) and micropolygyria (Hallervorden, 1949) but such brains also showed anoxic damage to the basal ganglia, a feature absent in the type of porencephaly now under discussion.

The possible role of early prenatal infection in causing malformations of the type described in this paper must be regarded as conjectural. However, the fact that Diezel's (1954) case of cytomegalic inclusion body disease was associated with cortical micropolygyria and a necrotizing process leading to porus formation suggests that other, less overt, infections may perhaps play a part in the aetiology of these obscure diseases of foetal life and perhaps in our case the pelvic infection present during the early months of pregnancy may not be entirely without significance.

SUMMARY

The brain of a spastic idiot aged 2½ years at death showed extensive bilateral defects of the frontal and parietal lobes. In these regions the walls of the hemispheres were represented by a thin sheet of neurological tissue lying beneath the leptomeninges. This membrane was attached laterally to the temporal and occipital lobes where it was continuous with the molecular layer and thinned-out remnants of the cortex. Medially it fused with an arch of neural tissue, identified as part of the cingulate gyrus, which passed sagittally from the region of the anterior commissure to blend with the occipital lobes. The structure of the membranous parts of the cerebral wall was similar to what is found in hydranencephaly. The left optic tract and the corpus callosum were absent. Signs of an old necrotizing process were seen in areas of gliosis and calcification in the claustra, in the roof of the posterior horns of the lateral ventricles and in the left external geniculate body. There was also a diffuse sub-ependymal gliosis with small calcifications and a patchy granular ependymitis of the ventricular system. Micropolygyria was present in much of the preserved parts of the cerebral cortex and there was hyperplasia of the striatum. Abnormalities were also found in the calcarine cortex where on the left side the stria of Gennari was absent and on the right the superficial extent of the area striata was increased. These malformations were considered to be secondary to a destructive process affecting the cerebral hemispheres during the third month of foetal life.

ACKNOWLEDGMENTS

Our thanks are due to Dr. C. D. Cross who provided the brain and the account of the post-mortem findings, to Dr. H. R. E. Wallis for permission to use his hospital notes and to Mr. R. V. Saunders for his report on the psychological tests.

This work was carried out with the assistance of the Nuffield Foundation.

REFERENCES

BECKER, H., *Dtsch. Z. Nervenheilk.*, 1949, **161**, 446.
COHN, R., and NEUMANN, M. A., *J. Neuropath. exp. Neurol.*, 1946, **5**, 257.
DIEZEL, P. B., *Virchows Arch. path. Anat.*, 1954, **325**, 109.
EDINGER, L., and FISCHER, B., *Pflugers Arch. ges. Physiol.*, 1913, **152**, 535.
HALLERVORDEN, J., *Allg. Ztschr. f. Psychiat.*, 1949, **124**, 289.
HICKS, S. P., *Arch. Path.*, 1954, **57**, 363.
LANGE-COSACK, H., *Arch. f. Psychiat.*, 1944, **117**, 1, 595.
NEUBURGER, F., *Beitr. z. gericht. Med.*, 1935, **13**, 85.
OBERSTEINER, H., *Arb. neurol. Inst., Wien*, 1902, **8**, 1.
PETERS, G., *Spezielle Pathologie der Krankheiten des zentralen und peripheren Nervensystems*, 1951. Stuttgart: Thieme.
RUSSELL, D. S., "Observations on the Pathology of Hydrocephalus", *Spec. Rep. Ser. Med. Res. Coun.*, 1949, No. 265. London: H.M. Stationery Office.
SMITH, H. M., NORMAN, R. M., and URICH, H., *J. Neurol. Neurosurg. Psychiat.*, 1957, **20**, 250.
SPIELMEYER, W., *Arch. f. Psychiat.*, 1905, **39**, 807.
TSANG, Y., *J. Comp. Neurol.*, 1937, **66**, 211.
WOLF, A., and COWAN, D., *Proc. Ass. Res. Nerv. Ment. Dis.*, 1956, **34**, 199.
YAKOVLEV, P., and WADSWORTH, R., *J. Neuropath. Exp. Neurol.*, 1946, **5**, 116, 169.

REFLECTIONS ON THE TEACHING OF PSYCHIATRY*

By

E. STENGEL, M.D., M.R.C.P.

Consultant Psychiatrist,
United Sheffield Hospitals;

Professor of Psychiatry
University of Sheffield.

My first duty is to thank you for having elected me President of this Section. I am conscious that this is one of the greatest honours which can come to a psychiatrist and I shall do my very best, within my limitations, to prove worthy of it. It is customary for the presidential address to deal with a topical problem of common concern, and one on which the President can speak with authority based on personal experience. I have chosen to talk about the teaching of psychiatry. I have called my address "Reflections" in order to make it clear that I cannot offer you more than some personal observations on a subject on which I feel deeply.

UNDERGRADUATE TEACHING

There are various reasons why the teaching of psychiatry to medical students has been much to the fore again recently. It is in a constant flux and its place in the medical curriculum is ill-defined. Little cause though there is for satisfaction, there has been much progress since the end of the war. Nevertheless, the British medical student is still at a disadvantage as far as psychiatric teaching is concerned, compared with most of his American and Continental colleagues. This is why progress seems to be too slow and why many of us are asking the question whether we have made the best of our opportunities. The undergraduate teaching of psychiatry has frequently been the subject of presidential addresses, the most recent by Dr. Armstrong, the President of the Royal Medico-Psychological Association. And there is a whole series of admirable addresses dealing with this subject, all of them delivered in this country during the last few years. I only mention those of Dicks, McCalman, Malcolm Millar, Desmond Curran, Noel Harris and Woodger, and last month we had Ewen Cameron's stimulating address on this problem. There is no better introduction to the aspirations of the teachers of psychiatry in this country than these lectures. Although they have a great deal in common, one would not like to miss a single one of them, because the authors' viewpoints differ sufficiently for each to make a contribution of its own. Happily, uniformity is not one of the faults of British psychiatric teaching.

I am sure that all of us are agreed that not only the quality of our general practitioners but the future of psychiatry in this country depends much more on the psychiatric teaching they receive as medical students than on anything else, including postgraduate training. Unless we teach future practitioners to see psychiatric problems and to deal with them, and unless we attract, by our teaching and example, a sufficient number of bright students into psychiatry, we shall succeed neither in training a good "basic doctor" nor in raising the standard of psychiatry. With the number of applicants for medical training declining almost everywhere, we have to expect increased competition for the able student. At any rate, the number of doctors who want to take up psychiatry is unlikely to increase. This makes it even more essential for us to make the best of our resources.

---

* Presidential Address to the Section of Psychiatry of the Royal Society of Medicine, delivered on 8 October, 1957.

What are we offering our students at present? A survey of the state of undergraduate teaching in the various medical schools in this country would make a fascinating evening, but is beyond the scope of my address. I should like to invite you, instead, to view with me the state of psychiatric teaching at the two Yorkshire Universities. This should be all the more enlightening as it differs considerably in the two medical schools. The Department of Psychiatry at Leeds was established by Dicks soon after the war, while the Psychiatric Department at Sheffield is still very much in *statu nascendi.* Psychiatric training at Sheffield used to consist of 18 lecture demonstrations in psychiatry and mental deficiency held at the local mental hospital and spread over two terms of the fifth year. There has been, since 1911, a compulsory terminal examination in psychiatry, written and clinical. The late Dr. W. S. Kay, who was Medical Superintendent of the Wadsley (now Middlewood Hospital) mental hospital made an endowment to the University for the purpose of an annual prize to be awarded for the highest marks in a compulsory examination in psychiatry. There is also reason for hope that psychiatry will in some form be included in the final examination in medicine. You can see that even before the creation of the Chair of Psychiatry, the provisions for the teaching of psychiatry at Sheffield had been slightly better than in some other schools. It has already undergone considerable modifications and expansion since I took over my appointment in July, 1956. It started with a pilot experiment. Professor Stuart-Harris invited me to do a weekly round with his clerks in his 40-bedded medical unit. I must confess that at first I was doubtful whether there would be a sufficient number of suitable patients for this purpose. However, any such doubt was soon dispelled. There was never a lack of patients with psycho-somatic conditions or neurotic symptoms or borderline states between neurology and psychiatry, or of suicidal attempts. The attendance, which was voluntary, was highly satisfactory and these rounds were altogether a most encouraging experience for all concerned. I shall always be grateful to Professor Stuart-Harris for having initiated them. As this experiment had proved successful, other medical firms were drawn into this scheme and for the last year I have conducted a weekly round with medical clerks in their wards. This means in practice that the student sees me about once a month during his junior and senior medical clerking. I hope that when I have a deputy there will be more of this teaching. But there are quite a few other occasions when the medical students are learning about psychiatry. They get to know me first in their third year, when I talk to them about the psychological aspects of illness in their introductory clinical course. In their fourth year they see a good deal of me, they meet me in the course of their junior medical clerking, they have two clinical seminars with me in their three weeks' social medicine clerking when I am trying to introduce them to the social and preventive aspects of psychiatry. In their fifth year the students spend an afternoon a week in my department over a three months' period. This gives them an opportunity of talking to patients and of observing the effects of treatment. During the fifth year they also have the 18 lecture demonstrations which are now shared between Dr. Thorpe, the Superintendent of Middlewood Hospital, Dr. Esher, Superintendent of several homes for mental defectives, and myself. During the year I give two lectures to the students doing the course of gynaecology and obstetrics. These lectures deal with the psychiatric aspects of these subjects. During his sixth year the student sees me again when he does his senior medical clerking. He is, of course, bound to meet me as a consultant in his pre-registration year.

Next year, when the whole 36 bedded psychiatric department of the teaching hospital will be functioning, the students will do one month's joint clerking in neurology and psychiatry during the fourth year, instead of their three months' attendance at my present unit. This will be possible to arrange because the two departments are closely adjacent. In introducing this clerkship we are following the example of St. George's Hospital.

You will agree that this is pretty good going, considering that I started at Sheffield only last year. I know, of course, that there are still some gaps; they will be filled in due course. But the principle that psychiatric teaching should be offered to the student throughout the clinical part of his studies has been established, not by me but by common consent. Psychiatry has been given a new deal at Sheffield. Its success will depend on the quality of the teaching and on whether I shall be able to get sufficient help.

It may be questioned whether this is the right way to do it. Desmond Curran has expressed himself against the psychiatrist teaching the psychological and social aspects of medical and surgical illness. This is in his view the concern of the physician and surgeon. Ideally, it ought to be, but very few physicians and surgeons feel competent to do justice to these aspects and most of them are very conscious of the lack of psychiatric training they received themselves. Charles Newman has recently reminded us that we are still living in the era of laboratory medicine which has led to the neglect of the patient as a person. It may also be argued that if the psychiatrist teaches on medical or surgical patients he should do this only in the presence of the physician or surgeon. This may be desirable but it is not practicable. In whatever way we conduct medical teaching nowadays, we are leaving the crucial business of integration to the students. The value of all teaching depends on whether it facilitates or disturbs this process.

I have so far not mentioned that the Sheffield student receives instruction also in psychology. He has ten lectures in the first term of the third year; unfortunately at the time when he is pre-occupied with his second M.B. examinations. I hope that it will be possible to move this important course to a more suitable place in the curriculum.

Let us now turn to Leeds, whose record in psychiatric teaching is second to none among English universities. I am indebted to Professor Hargreaves for detailed information. An introduction to various aspects of psychology, including the social and developmental, is given in 40 lectures spread over the last term of the third year and the first term of the fourth year. There are several seminar sessions devoted to case-taking and interviewing in the introductory clinical course in the third year. Psychiatric syndromes are taught in 20 lectures in the fifth year during which the student does over three months half-day psychiatric out-patient clerking, including attendance at the Child Guidance Clinic attached to the University Department of Psychiatry. There are also the usual visits to mental hospitals and mental deficiency colonies. The psychiatrist takes an active part in the final medical examination. Professor Hargreaves feels that more intensive teaching in small groups would be highly desirable, but this is impossible with the existing teaching establishment.

You can see, therefore, that the psychiatrists in these two medical schools have no cause for complaint about not being allotted enough students' time during the clinical part of the curriculum. Their difficulties arise from the inadequacy of their teaching establishments. These will be even more serious at Sheffield than at Leeds which has what is regarded as a standard size university department with a child psychiatry section. There is a real danger that psychiatry will fail to make its vital contribution to medical education, not because its importance is unrecognized, but because it is denied the means to play its part. And the conditions in the two Yorkshire universities are in many respects better than in some other medical schools.

What is the impact of these teaching efforts on the student? There are many indications that the student is unprepared for it, and continues, like most of his medical and surgical teachers, to regard psychiatry as a more or less interesting stranger in his otherwise well-ordered curriculum. Having spent the three most formative years of his medical education learning about physics, chemistry, anatomy and physiology, and having been taught to look at the clinical part of his studies as the application of those sciences, he cannot fit psychiatry into his scheme of things. The better a student he was, the greater will be his bewilderment and resistance when he is faced with the psychological and social problems of the living person. We know from our own personal experience how difficult it is to overcome these attitudes. When psychiatric instruction commences it is usually too late. There has been a growing realization of this fundamental fault of present-day medical education, with its sole emphasis on physical structure and function, and its neglect of the person in health and disease. I am all with those who advocate the serious teaching of human behaviour in all its aspects throughout the pre-clinical period. The first psychiatrist to make this demand was, of course, Adolf Meyer who as far back as 1911 started his crusade for the inclusion of "the person" into the pre-clinical curriculum. Having the courage of his convictions he experimented along these lines. In my opinion, Meyer's strongest claim to fame rests on his having initiated the humanization of what has been called the "corpse-centred curriculum". The resistance to this change has been considerable, but our American colleagues who have taken up the challenge thrown down by Adolf Meyer are probably pioneers of a new era of medical education, the dawn of which Charles Newman believes to be upon us, after an era of unadulterated laboratory medicine. It is sometimes thought that the demand for the introduction of living man into the pre-clinical period comes mainly from psychoanalysts. Yet in this country it has been strongly advocated by psychiatrists of all orientations. I only mention Dicks, McCalman, Noel Harris and Armstrong, and the last has made a strong plea for such pre-clinical instructions to be the subject of a compulsory examination.

But what is the student to be taught and by whom? Much sound advice has already been offered on this. I find it as difficult to see ahead of my time as anybody else, but in the light of my experience as a teacher of psychiatry and with the painful consciousness of the gaps in my own basic medical education, I am confident that I could draw up a formidable list of areas of psychology and social science about which the medical student should have some knowledge before he embarks on his clinical course. The teaching would at first have to be shared between the psychologist, the social scientist and the psychiatrist, but maybe before long a new type of teacher of human behaviour will emerge out of the successful integration of sciences concerned with behaviour. At any rate, the time has come for the pre-clinical teaching of the sciences basic to psychiatry to be thoroughly discussed by all concerned.

Postgraduate Teaching

Undergraduate teaching of psychiatry has not been the subject of much discussion and controversy, which is a pity. The same cannot be said of postgraduate teaching, which, from the point of view of general medical education, and even of psychiatry, is second in importance to undergraduate teaching. For a variety of reasons, the former seems to have acquired more prestige in this country than the latter, which has not been the case elsewhere. One of the reasons is probably the fact that the postgraduate school of psychiatry in London ("The Maudsley") is the only large centre of psychiatric teaching and research in this country and that the majority of the teachers of psychiatry were associated with it.

Postgraduate teaching presents a great problem to the psychiatric departments of the provincial medical schools which are expected to provide it for their respective regions. Take the Sheffield Region, which embraces several counties with a total population of more than 4 millions. The young doctors who are working in the numerous psychiatric hospitals of this area look to Sheffield University for help with their postgraduate studies and they are referred there by their seniors. The same holds, of course, true of other regions. I shall try to put before you the problem of postgraduate teaching seen from the viewpoint of a provincial medical school which has until recently had no department of psychiatry. It is eleven years since Professor Lewis, in his presidential address to this Section, discussed this very subject as it presented itself to him at the time. I shall frequently refer to his brilliant address which is full of good sense and wisdom.

Soon after I took up my appointment at Sheffield I met a group of young psychiatrists working in the Region to discuss with them their educational problems. There were about 20 of them. They knew exactly what they wanted, namely a course like that offered at the Maudsley, obviously ignorant of what that implied. I told them straight away that this was out of the question and explained why. I promised to do my best to help them. As it happened, the Northern and Midland Branch of the R.M.P.A. was to meet at Sheffield, and my suggestion to make postgraduate training within the area covered by the division the topic of the meeting was accepted. A year ago almost to the day, we had a symposium in which all the heads of the Departments of Psychiatry of the five Northern Universities took part. It was decided to form a working party to study the problem. It met twice and reported to the spring meeting of the Division. The report with proposals has been submitted to the Educational Committee of the R.M.P.A. which will no doubt put them on their agenda shortly. I have no intention of discussing them here, but I should like to give you my personal observations about the state of postgraduate teaching in the North of England and in the Midlands.

After the end of the war postgraduate training schemes were either revived or newly established in the universities of Manchester, Leeds and Durham, which also award diplomas. Birmingham and Liverpool followed later with similar courses, without offering diplomas of their own. The training schemes were rather ambitious and modelled more or less on the three years' Maudsley course. The requirements of the post-war Conjoint D.P.M. had to be drastically revised, as they had proved quite unrealistic, and now the only formal requirement is two years psychiatric hospital practice. This change has had a serious effect on the existing university courses which for other reasons had never been flourishing. Even the London Academic Diploma is taken by only very few of the large number of postgraduate students training in and around London. It is therefore not surprising that provincial diploma courses can hardly hold their own. One of them, that of Bristol, expired quietly, having never shown much vitality.

Obviously, something went wrong with these schemes. They were based on anticipations which did not materialize. When the National Health Service was initiated it was expected that there would be a steady stream of postgraduate students, with the newly-created university departments of psychiatry acting as the focal centres of training and research. Instead, we can hardly fill the meagre junior establishments of the mental hospitals, and consequently training courses which necessitate the students' absence from his work for any length of time, create difficulties all round, as substitutes cannot be provided. Also, it was anticipated that the psychiatric services would expand. Instead, we now have a frozen establishment which is far from adequate. A gradual growth of the psychiatric university departments was envisaged. Instead, financial stringency has held up their development, and now there appear to be no prospects of expansion before this country has caught up on others in technology.

As the result of these and other factors the state of postgraduate teaching in psychiatry is most disconcerting. Ambitious diploma courses are run by small university departments hardly big enough to provide adequate undergraduate teaching, which after all is their main business. And all this effort, which takes up a great deal of the teachers' time which they can ill spare, is spent on a tiny number of postgraduate students who as a rule have no academic aspirations. Possibly, it was hoped that if the departments took on more than they could cope with, expansion would follow of necessity. If so, this hope was not fulfilled. These comparatively small departments are expected to combine the following functions: to provide a model psychiatric service with in- and out-patient facilities for a large teaching hospital; to look after the teaching of the undergraduates, to run elaborate postgraduate courses for the Region, to keep the general practitioners up to date in psychiatry and to advance knowledge by research. Obviously, some or all of these functions are bound to suffer.

This, then, is the situation of postgraduate teaching: a shrinking number of students who are given a great deal of systematic teaching at a heavy price for all concerned, and a large number working in mental hospitals who do not get planned training at all. A few "haves" and many "have-nots", whereby the "haves" are not necessarily the better ones, because it depends on many circumstances beyond his control whether or not a doctor can enter for the university course. The "have-nots" also want to get on and they travel to London at regular intervals, to "have a shot at the D.P.M." without having received any help from the university department at all. No wonder that too many of them are found wanting. The only real beneficiaries are British Railways and a few Bloomsbury hotels. This state of affairs does not encourage young doctors to take up psychiatry.

Whatever the reasons, it is a fact that the big area of the North and the Midlands, in which more than two-thirds of the population of England live, and which has the biggest concentration of universities in the country, has failed to train the psychiatrists it needs. At the same time, we are witnessing a kind of academical inflation: too many university courses working all out for too few postgraduate students, while the bulk of those in need of help get nothing at all. Another unfortunate and paradoxical feature of the present situation is the increasing number of postgraduate students who are working for two psychiatric diplomas for considerable periods. They enter a university course without the intention of going through with it, or knowing that they will not be eligible for the final part. They believe it to be in their interest to make advances to the daughter of the house (I mean the local D.P.M.), even though it is most unlikely that this relationship will ripen into a lasting attachment. At the same time, being realists, they seek contact with her less precious, though perhaps more unpredictable and fickle, rival. But is this not another feature of inflation: that the customer would feel compelled to buy what he does not need and not even want? Professor Lewis, in his presidential address here, stressed the need for getting away from the "D.P.M. outlook". It is sad to have to put on record eleven years later, that since then this outlook has not only become more widespread among the students but has affected some of their teachers. May I put in a plea for at least getting away from the *double* D.P.M. outlook, a kind of spastic diplopia with severe blurring of vision, endemic in university departments and institutes with their own D.P.M.s and not confined to the North of England. I should not be surprised if before long more universities should follow Bristol's lead and suspend their D.P.M.s. The amount of money and time that would thus be saved by the universities and the students might be more profitably spent on postgraduate teaching in psychiatry. In some respects the state of psychiatric education in this country with its many D.P.M.s—10 in the British Isles—is reminiscent of 18th century Europe with its many kingdoms and principalities. It is time we realized that we cannot afford this. Drastic reduction of the number of psychiatric diplomas would in all probability enable the Conjoint D.P.M., which would be the natural choice for a national diploma, to be made a more satisfactory examination than it is at present.

I have so far concerned myself mainly with those parts of England which cannot draw on the teaching facilities of London. As far as I know, none of the London medical schools has undertaken organized postgraduate teaching on the same lines as some provincial universities have. We have, however, to concern ourselves with the London postgraduate school of Psychiatry, for short "the Maudsley", which, in virtue of its unique position is a national rather than a London institution. What contribution can a central postgraduate school make to the needs of the rest of the country? As the Maudsley offers planned teaching only to those working in its affiliated hospitals, in addition to making lectures available to students working in the London area, it can make no direct contribution to the needs of those working further afield. Perhaps, then, the right solution of our difficulties would be to advise as many postgraduate students as possible to seek appointments either at the Maudsley or within easy reach of it, to get themselves educated and return to the North. Such advice, one would have to give if one was convinced that the training offered in London was the best answer to the psychiatrist's educational needs and that there was no alternative. I think it is fair to say that this view is not generally held.

It may, to some of you, appear not quite proper for me to discuss here the function of an individual institution, while so far, in my critical review, I have refrained from doing so. There was no need for this because everything I said applied to certain types of institutions. But in talking about the functions of a postgraduate school of Psychiatry in this country, I cannot talk in general terms, since the Maudsley is the only representative of its type. To consider postgraduate psychiatric education and leave out the Maudsley would be the same as talking about grand opera in England without mentioning Covent Garden.

I am sure my friends at the Maudsley would never forgive me such an omission. As I am a Maudsley man, but not only a Maudsley man, I regard myself well qualified to discuss the role of this great Institute within British psychiatry. Though I can claim no credit for its great reputation in the world at large, I am as much responsible as any other member of its staff past and present for what went wrong, if anything.

Now there is no gainsaying that this famous Institute is generally felt to stand apart from British psychiatry. Why should this be so? Let us not forget that the concept of the postgraduate institute is altogether new and can be regarded as being still on trial. If by some miracle, large funds for psychiatry should overnight become available, should we want to have a few more Maudsleys after the image of the one we have already, or should we perhaps, in the light of our experience, try a different set-up of a postgraduate school, possibly one not divorced from undergraduate teaching? I am not sure of the answer, and there is room for controversy.

If we compare the Maudsley with other institutions of the same type, such as the postgraduate schools of Medicine and Neurology, the most striking difference is in the relationship to their respective disciplines. Obviously, there are *open* and *closed* postgraduate schools, those of medicine and neurology belonging to the open type. They maintain in their teaching function active relations to medicine and neurology up and down the country. If we look at the diaries of the medical press, hardly a week passes without a physician or neurologist from outside lecturing there. Thus the postgraduate student is in frequent contact with personalities and work going on outside, in addition to having the benefit of the teaching by the senior staff of his respective school. Any tendency on his part to believe that nothing and nobody worth knowing exists outside his school is thus successfully counteracted. His training is in keeping with the concept of a liberal university education. The contacts between the senior staff and their guests must also be of great mutual advantage. In contrast, the postgraduate school of psychiatry is a strictly closed school. The rare guest lecturers are invariably travelling scholars from abroad whom a lucky star has brought to our shores. The students do not get to know British psychiatrists working outside their school at all. This system, which I suppose has much in common with that of the ancient public schools, must have advantages, otherwise it would not exist. If so, they are in my view outweighed by the disadvantages. The student tends to form the impression that Denmark Hill is an oasis in a psychiatric desert, and the occasional appearance of lecturers from abroad is likely to strengthen this belief. It is true, he meets a British extra-mural psychiatrist at his examination, but this situation is only rarely conducive of genuine mutual appreciation. Naturally, having to leave when his time comes is for the student a terrible come-down. Nor does the exclusiveness of his school act as a stimulus on the student to take an interest in the activities of the scientific societies with which London abounds. Looking around in this hall I have always been saddened by the absence or the small number of postgraduate students present. It also seems to me a serious matter that they are apparently not interested in the problems of undergraduate teaching. Recently, several young Maudsley men have obtained important teaching positions in medical schools outside England and we all are delighted about it. Their start would have been much easier if they had learned something about the most important aspect of the work they are going to do. The closed system has also disadvantages for the seniors who would benefit from more contacts with psychiatrists working elsewhere, who, in turn, would gain a great deal from meeting their colleagues at the Maudsley. I assume that this self-imposed isolation is only a passing phase, and there are indications that the Institute is growing out of it.

You gather that I shall not send postgraduate students to the South for training indiscriminately. But there are other things which I shall not do *indiscriminately*, e.g. advise them to have a psychoanalysis. Nor shall I advise them *indiscriminately* "to get their Membership first". Now here I am on delicate grounds. I want, of course, those who enter psychiatry to have a sound knowledge of medicine, but to insist on young doctors who want to specialize in psychiatry entering for a competitive examination, one of whose functions it has always been to limit the number of those who aspire to consultant rank in general medicine*, seems to me almost like expecting somebody who wants to join a football team to have played county cricket first. I shall of course advise students who are both highly intelligent and good at examinations and have access to first-class training facilities to take this course, since "the Membership" is the Marshal's baton in the psychiatrists' knapsack. But this advice given to all and sundry has lost psychiatry many a good man and has broken the spirit of many others. Fortunately, there are other ways of achieving eminence in psychiatry. All these and many other considerations enter into the problem of postgraduate training in psychiatry.

You have listened patiently to my observations on the situation of postgraduate training in the provinces and you have followed me on my detour to the largest and most important centre of postgraduate education in our discipline. You no doubt feel that it is about time for me to produce some constructive suggestion. I shall try to do this now. It is, of course, not my business to proffer advice to my colleagues in the North or indeed anywhere else. I propose to tell you what we are doing at Sheffield for postgraduate students not working in my department. You have noted that I have concerned myself with the machinery of teaching and not with what ought to be taught. But what would be the use of arguing about what to teach and how, as long as no machinery exists? At Sheffield I am in the fortunate position of having to start from the beginning. There is a joint registrar scheme with Newcastle by which a small number of postgraduate students enlist in the Durham diploma course, which implies six months residence at Newcastle. But this association is unlikely to continue in its present form. Until recently the large majority of postgraduate students received no help from the university centre at all. In my attempts to remedy this situation I have been guided by the following principles.

The university department must give the students some help with their postgraduate studies. There can be no spoonfeeding; there will be no systematic lecture courses of any sort nor systematic instruction in anatomy and physiology. The student has to learn these by himself, but he is given the opportunity of seeing microscopic slides of normal anatomy and neuropathology in the laboratory of the neurosurgical department. The students are invited to come to Sheffield for one afternoon a fortnight for seminars in certain aspects of clinical psychiatry, psychology and neuropathology, for which Dr. McKellar, the lecturer in psychology, Dr. Wolman, the consultant neuropathologist and myself are responsible. There are additional arrangements for neurological instruction in Sheffield and the students are encouraged to attend Child Guidance Clinics nearest to their place of work.

---

* This applies only to the Membership of the Royal College of Physicians of London.

The purpose of the seminars is to discuss special problems and to guide the students in their studies. There are no fees. These seminars, which have been going on over two terms have proved very popular and have been attended by 15 postgraduate students from all parts of the region. They do not encroach unduly on their time. This is as much as the university department can offer, in fairness to its various other commitments. It is not a great deal but it is the only alternative to nothing at all. Those working in the local mental hospital (Middlewood Hospital) see a little more of me as I attend a conference there once a week. From May, 1958, when my department will be fully functioning, there will be an additional clinical conference and one seminar. These will be accessible to all postgraduate students and psychiatrists in the Sheffield area.

But all this is, of course, not enough for the students not working in my department. Obviously the university centre with its very slender resources can only make a limited contribution to their educational needs. I believe that in the past the universities have taken on too much responsibility and even a monopoly for postgraduate teaching. The mental hospitals have all too readily accepted this situation and have not attempted to contribute to the student's educational requirements, apart from offering him clinical material and the position of an apprentice. That this is fundamentally wrong has been recognized long ago, but apart from a small minority of hospitals where special arrangements for postgraduate training exist, nothing consistent has been done about it. The suggestion has sometimes been made that a particular mental hospital should be affiliated to the university department and given special status as an educational centre. In the provinces this would be the local mental hospital. Such an arrangement would imply that many mental hospitals of great reputation would be denied the opportunity of playing their full part in psychiatric education. Some of them have developed into notable training centres, not because they were nearer to, but because they were further away from the university department than the rest. I have made the following suggestion concerning the mental hospital's role in postgraduate teaching.

In every hospital which is recognized as a training place, there ought to be one among the senior staff who will take it on himself to look after the educational needs of the juniors. This function would not take up much of his time. He would be the man who would organize conferences and perhaps seminars, advise the students what to read and how to learn. He would act as a liaison officer with the university department. The knowledge that there is a man in the mental hospital whose function it is to help them with their educational problems would be invaluable to the students.

I am sure that a suitable person should be available in every hospital. So-called academical calibre is much less important than willingness to help. The senior staff would have to choose this man amongst themselves, preferably from the more recently appointed consultants who were postgraduate students themselves not so long ago. I do not envisage this to be a formal appointment but rather a function attached to a member of the staff for certain periods. No special privileges should be associated with this function, which should carry its own rewards. I am confident that the creation of this role by common consent would transform the mental hospital into a place where learning and teaching have a recognized position. I originally proposed that the person performing this function should be called "Education Officer" but other and probably better titles have been suggested, such as "Clinical Tutor" or "Advisor on postgraduate training". I am glad to be able to say that this suggestion has had a friendly reception among my colleagues in the Sheffield Region. The

Sheffield Regional Hospital Board, which has been very much alive to the problem of postgraduate education, has adopted this suggestion and advised its larger mental hospitals to nominate a member of their senior staff for this function. I shall meet them as a group at regular intervals and discuss their functions and problems. Thus something like a faculty for postgraduate education in psychiatry has been established. This Sheffield experiment might prove of considerable interest to other regions.

Although this scheme seems innocuous enough it may nevertheless meet with resistance. The question will be asked whether the Superintendent, usually the most experienced man in the hospital, would not be the most suitable person for this function which he had always filled anyhow. Although I would not wish to exclude the Superintendent, his position, as the most senior physician and chief of medical administration, is, for psychological reasons, not quite compatible with the kind of role I envisage this man to play. It was actually Dr. Macmillan of Mapperley Hospital who remarked that the youngest among the consultants may be the most suitable man for such a function which has also been compared with that of a sub-dean. It is clear that without the superintendent's whole-hearted co-operation and encouragement such a scheme is likely to fail. With his active participation it is bound to succeed.

I realize that the outcome of any such project depends on all concerned, but it would at least offer the special machinery which has been lacking hitherto. Teaching in the mental hospital has been everybody's job, but, as you know, "everybody's job is nobody's job". To make a scheme such as this work would be a real challenge to mental hospitals and I should not be surprised if those which make a success of it would find it easier to attract junior staff. I do not think I am unduly optimistic in hoping that such schemes could be made to work. Something like it was actually practised when Mayer-Gross worked at the Crichton Royal and I at Graylingwell Hospital. Surely there must be a few in every hospital who want to help their young colleagues and thus raise the standard of their own work.

But there are quite a few other methods of contributing to the educational needs of the postgraduate student. The Maudsley Bequest Lectures, so brilliantly planned and organized by Dr. Sargant, have shown the way. The Glasgow Faculty of Physicians and Surgeons are this autumn running a series of symposia in psychiatry which promise to be of great value for all ranks, but these are special offerings and no substitutes for a climate of teaching and learning.

These, then, are some reflections on the teaching of psychiatry. I commend them to your consideration.

REFERENCES

ARMSTRONG, R. W., *J. Ment. Sci.*, 1957, **103**, 691.
CURRAN, D., *Brit. Med. J.*, 1955, *ii*, 515.
DICKS, H. V., *Lancet*, 1950, *ii*, 317.
HARRIS, N. G., *J. Ment. Sci.*, 1955, **101**, 1.
LEWIS, A. J., *Lancet*, 1947, *ii*, 79.
MACCALMAN, D. R., *Brit. J. Med. Psychol.*, 1953, **26**, 140.
MEYER, ADOLF, *Training the Doctor*, in *The Commonsense Psychiatry of Adolf Meyer* (ed. E. Lief), 1948. New York.
MILLAR, W. M., *Brit. J. Med. Psychol.*, 1954, **27**, 30.
NEWMAN, C., *The Evolution of Medical Education in the 19th Century*, 1957. London.
WHITEHORN, J. C. (ed.), "Psychiatry and Medical Education, Washington, 1952-1957", *J. Amer. med. Ass.* 1957, **2**, 538.
WOODGER, J. H., *Physics, Psychology and Medicine*, 1956. Cambridge.

A TEST FOR RESIDUAL MENTAL ABILITY IN SENILE DEMENTIA

By

MOYRA WILLIAMS, D.Phil.*

United Oxford Hospitals' Geriatric Unit, Cowley Road Hospital, Oxford

INTRODUCTION

MEASUREMENT of the residual abilities in patients suffering from senile dementia is difficult to carry out with the present techniques which, having been standardized on younger people, tend to miss many of the characteristics of mental decline through ageing.

Much attention has, however, been given to these characteristics in recent experimental studies (Welford, 1951; Birren, 1955; Szafran, 1955; Macfarland and Fisher, 1955), and it has frequently been noted that if given enough time, enough perceptual "cues" and enough "help", older people can do nearly as well as younger ones. The chief difference between ability and disability in this condition does not, therefore, lie in what an individual can or cannot do, but in the amount of assistance he needs to do tasks of a certain standard.

This realization suggests that a new type of mental test technique might be evolved in which measurement is applied to *the amount of help a person has to be given* in order to succeed in a standard task. In other words, the patient can be progressively, consciously and quantitatively helped until he succeeds. The measure of his ability will be a measure of the kind and amount of help necessary for him to achieve success.

In the present paper, an account will be given of a pilot investigation in which a test based on this principle was applied to 36 old people, aged between 60 and 95 years, in the United Oxford Hospitals' Geriatric Unit.

TEST MATERIAL AND PROCEDURE

The present test battery consisted of 3 items, chosen to investigate the spheres of (1) Memory, (2) Reasoning, (3) Manipulation of visuo-spatial relationships (see appendix). Aids were given in two forms: verbal and mechanical, each form being graded as shown in the appendix.

For each test, the task was first explained to the patient who was then given some moments to try to solve it alone. If no solution was forthcoming, he was then given Aid V1, followed by M1, followed by both together (V1 and M1). The aids were increased in stages (V followed by M followed by V and M together) until the patient succeeded. The "score" for each test was taken as the total number of aids required by the patient to succeed.

It is, of course, fully realized that the more difficult a task, the more help a person may need in solving it. Because "difficulty" is not easy to define, the tests of Reasoning and Manipulation used in the present battery were taken from two well-known and carefully standardized psychometric scales—Raven's Matrices (1938) and the Wechsler-Bellevue Scale (Wechsler, 1944). A suitable test for Memory presented greater problems, since Memory is largely a personal affair and satisfactorily standardized tests to assess individual abilities have so far not been produced. Williams (1953) has described tests of recall and recognition consisting of pictures which turned through a series of graduated stages, from a shapeless blot into the silhouette study of an animal. Since this test allows for the measurement of Memory in terms of the number of prompts necessary for recall—i.e. a system of measurement similar to that used for reasoning and manipulation—the test has been incorporated in the present battery.

---

* Member of the Nuffield Mental Health Research Team.

Verbal items were not included in this battery despite the well-known fact that "verbal" ability is more resistant to organic breakdown than general performance (Babcock, 1941). The reasons for this were as follows: (1) The battery described here was specifically intended to measure present efficiency rather than "basic I.Q.". (2) It has frequently been noted that in severe dementia even the ability to use and manipulate words may deteriorate (Brody, 1942). (3) It was hoped to develop a test which could be applied to patients suffering from specific verbal defects (dysphasia) as well as to those suffering from generalized dementia—indeed, a test which would differentiate between the two groups. (4) Where verbal material is employed in a test, some form of memory is required for its solution—if only to keep track of the instructions—and patients with severe memory disturbances frequently do less well on such tests than on those of the "performance" type.

SUBJECTS

The subjects used in this investigation were all patients from the Cowley Road Hospital. They were divided into three groups as follows:

(1) *Control Group*. Twelve patients who had been admitted for physical disorders or disabilities (arthritis, fractures, pneumonia, etc.) but who in the opinion of nursing and medical staff presented no signs of mental derangement. These patients were all well orientated, could give a good account of themselves, and occupied themselves spontaneously to the best of their abilities.

(2) *Amnesic Group*. Twelve patients who, in the opinion of the nursing and medical staff presented problems of management and disposal primarily for reasons of mental impairment. They were all disorientated in time and space, could not look after themselves, and did not occupy themselves except under supervision. Although many had originally been admitted to hospital with physical complications (cardiac and respiratory disorders, etc.), all were up and dressed and considered to have made a good physical recovery at the time of testing.

(3) *Dysphasic Group*. Twelve patients who were suffering from some degree of speech disorder at the time of testing. An attempt was made to rate the degree of speech disorder present on the following scale:

Expressive (Motor) Disturbance

Grade	Performance
1	Manipulates words to build sentences in normal conversation.
2	Uses words in well-structured settings (i.e. to give Opposites or complete such simple sentences as "God save the ——"), but has difficulty in naming small objects (i.e. the hands or the winder of a watch).
3	Can repeat sentences or names, but cannot say them from memory a few seconds later.

4	Cannot repeat words to order, but has a fair vocabulary.
5	Speech limited to a few perseverative sounds.
6	Inability to make any sound.

Comprehensive (Sensory) Disturbance

Grade	Performance
1	Obeys orders given in fast, ordinary conversational tone.
2	Obeys orders given in slow, carefully enunciated speech.
3	Obeys orders if given slowly and accompanied by slight gesture.
4	Copies gestures and seems to grasp their meaning.
5	Cannot copy gestures, but responds to emotional expressions (smiles, etc.).
6	Does not respond to emotional expression in others.

As well as varying in the degree of dysphasia present, the patients in this group undoubtedly varied considerably in their degree of dementia. Thus, in some patients, loss of speech was superimposed on a loss of orientation and memory, although in others this was not so.

The three groups of patients were matched as closely as possible for social background, length of stay in hospital, and age, although as will be seen from Table I, the dysphasic group tended to be younger than the other two.

TABLE I

Showing the Distribution of Subjects in Each Age-group

Age	Group 1 Control	Group 2 Amnesic	Group 3 Dysphasic
90–95	1	2	–
80–89	5	5	2
70–79	5	5	4
60–69	1	–	6
Total	12	12	12

RESULTS

Control and Amnesic Groups

Tables II to IV show the distribution of the scores on each of the tests for each of the three groups tested. It will be seen that there is no overlap between the Control and Amnesic groups on the Memory test, indicating that this test bears out the clinical impressions by which the groups were selected. There is a slight overlap on the total scores of the other two tests, but from Figures 1 and 2 which show an analysis of the scores in terms of the sensory mode (verbal, mechanical or both) in which aids were given, it will be seen that whereas the control group responded readily to verbal aids, the amnesic group required verbal *plus* mechanical aids in the majority of cases.

Dysphasic Group

The performance of the dysphasic patients as a group fell about mid-way between that of the control and amnesic groups (Tables II–IV), but as might be expected, these patients responded much more readily to mechanical aids than to verbal ones (Figs. 1 and 2). Despite the smallness of the group and its lack of homogeneity, further analysis of the scores was undertaken to discover the relationship between test performance and (1) Age, (2) Degree of speech impairment.

Table II

Showing the Distribution of Subjects in Each Group, According to the Number of Prompts Needed on the Memory Test

Score	Group 1 Control	Group 2 Amnesic	Group 3 Dysphasic
9	–	11	6
8	–	–	–
7	–	1	1
6	–	–	2
5	–	–	–
4	–	–	–
3	4	–	1
2	3	–	2
1	1	–	–
0	4	–	–
Totals	12	12	12

Table III

Showing the Distribution of the Subjects in Each Group According to the Number of Prompts Needed on the Matrices

Score	Group 1 Control	Group 2 Amnesic	Group 3 Dysphasic
60–69	–	1	1
50–59	–	1	1
40–49	1	4	–
30–39	5	4	4
20–29	4	2	3
10–19	2	–	3
Totals	12	12	12

Table IV

Showing the Distribution of the Subjects in Each Group According to the Number of Prompts Needed on the Object Assembly Test

Score	Group 1 Control	Group 2 Amnesic	Group 3 Dysphasic
60–69	–	1	–
50–59	–	2	1
40–49	1	3	1
30–39	1	4	3
20–29	4	2	3
10–19	3	–	3
0–10	3	–	1
Totals	12	12	12

The relationship between Age and performance on the different tests is shown in Table V. No consistent differences were seen to occur between the different age groups in this small sample. The relationship between degree of speech impairment and performance is shown in Table VI. No significant differences are associated with the degree of Expressive (motor) disturbance, but the scores on the Memory and Matrices test increased (i.e. deteriorated), with the degree of Comprehensive (sensory) disturbance present. This is in accordance with the general clinical impression and serves to encourage con-

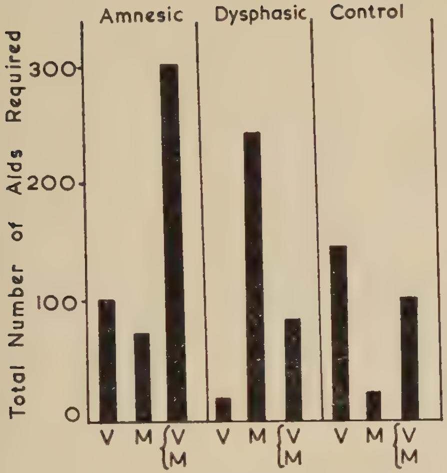


FIG. 1.—Showing the distribution of the total number of Aids needed per group on the *Matrices* Test according to the mode in which they were given.

V Verbal aid
M Mechanical aid
V M } Verbal and Mechanical combined

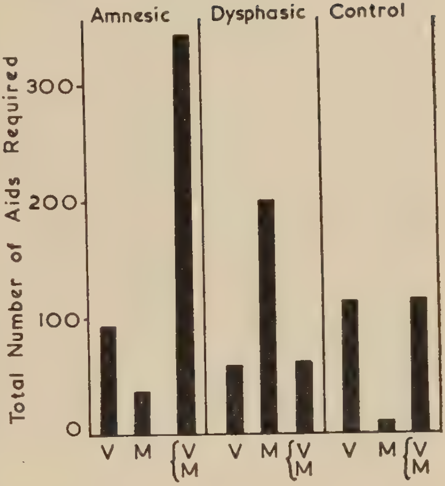


FIG. 2.—Showing the distribution of the total number of Aids needed per group on the *Object Assembly* Test according to the mode in which they were given.

V Verbal aid
M Mechanical aid
V M } Verbal and Mechanical combined

TABLE V

Showing the Relation Between Age and the Performance on the Different Tests on Subjects in the Dysphasic Group

Age	No. in Group	Average Scores Memory	Matrices	Object Assembly
60–69	6	6·6	29·6	26·6
70–79	4	5·5	28·5	27·0
80–89	2	9·0	36·0	30·5

TABLE VI

Showing the Relation Between Degree of Speech Disturbance and Performance on the Different Tests in Subjects in the Dysphasic Group

Grade of Speech Disturbance	No. in Group	Average Scores on: Memory	Matrices	Object Assembly
Expressive (Motor)				
1 and 2	5	5·0	38·8	29·6
3 and 4	3	7·0	22·0	15·3
5 and 6	4	8·5	26·0	30·2
Comprehensive (Sensory)				
1 and 2	5	5·2	20·2	18·2
3 and 4	5	7·2	32·4	32·0
5 and 6	2	9	50·0	32·0

fidence in the value of this method of testing as a means of assessing intellectual efficiency in this very difficult group.

Insight into Individual Abilities

The present test technique and battery were not designed as a method of distinguishing group differences and the only reason for giving the foregoing figures and tables is to indicate that the data gained on the test conforms to clinical findings. The real advantage of the method seems to lie in the opportunity it affords for appraising individual variations in a disorder where such variations have never before been quantitatively assessed. That all old people tend to become forgetful, that cerebral lesions cause major disturbances of intellectual function, and that gross amnesia is a prominent symptom in senile dementia are well-known facts. That gradations among these disabilities exist and that such gradations can be measured is not so generally recognized, and the value of the present test technique can best be seen from one or two examples of individual performances.

Two patients, both of whom were very forgetful, and who on the memory tests in current use might both have scored nothing at all, responded to the present test in the following manner:

Aid	Patient A (True senile dementia)	Patient B (Recovering dysphasic; c/o very poor memory)
V1 Do you remember those pictures I showed you?	When was that? I don't remember any pictures.	Pictures? No.
M1 Shown outside of booklets.	No.	No.
V2 They were pictures of animals.	What sort of animals?	No, that's what it is you see. I do remember some pictures now you mention it, but couldn't say what.
M2 Do you remember seeing any of the animals on this page?	No (began naming them).	Of course, the dog and the goose.
V3 There was another one —one we see at the zoo.	(Began naming them again.)	That must be the elephant. Yes, I remember it now, but I would never have done so unless you had reminded me. That's what it is.
M3 Pages of booklets turned as before.	(Recognized animals at same stage as previously except for gain on one stage on elephant.)	

It will be seen at once that Subject B really had a much better memory than Subject A, although unable to recall any of the pictures without some degree of prompting.

On the Matrices tests as on the Memory test, individual difference in response to the aids can be recognized. For example, two subjects who were originally considered to be equally demented, and neither of whom produced the correct response to more than one of the items without assistance, were creating a disturbance in the General Hospital ward and were being considered for transfer to a mental hospital. On testing with the present technique one was still able to respond to verbal and logical aids on the Matrices, while the other could only respond to gross mechanical aids. Generalizations from the test results proved to be fairly accurate. The better of the two patients settled into the hospital routine after a short time, but the other continued to deteriorate, and transfer to a mental hospital proved to be necessary.

Similar differences were seen in the responses to aids during performance of the Object Assembly test. Patients who were all regarded as grossly demented and who were none of them able to assemble the pieces unaided still varied in their behaviour from those who needed the minimum of verbal guidance to those whose hands had to be guided for them by the examiner.

The value of this approach was most apparent, however, in cases of severe dysphasia. For example, a 63 year old man was under observation in hospital for some months following a left internal carotid thrombosis which had left him with a right hemiplegia and complete aphasia. During the first weeks of this patient's stay in Cowley Road Hospital, it was almost impossible to form an idea of his intellectual capacity. He was withdrawn and resentful, and although he never appeared to be disorientated in time or space, recognized his wife, and fell readily into the hospital routine, he would not co-operate in any form of therapeutic activity. His wife was anxious that he should be discharged from hospital and returned home, but the authorities were afraid that the task of looking after him would prove too much for her and precipitate a breakdown in the home situation.

On 28 May, 1957 an attempt was made to assess the patient's intellectual capacity by the ordinary psychological procedures, but after a few trials on each test he tended to become emotionally disturbed at his failures and would push the test material away. No "score" was obtained on any of the Weschler test material, although the impression was gained that the patient was really taking in more than appeared.

On 20 June, 1957, another attempt was made to assess the patient with the procedure described here. In the meantime there had been little signs of clinical improvement. It was discovered that the patient responded well to the minimum of mechanical aids. Moreover since he was never allowed to "fail" on any part of a test, his co-operation was retained throughout and a good degree of intellectual preservation was noted.

Discussion

In generalizing from any test result about the subjects' abilities in other settings, care must, of course, be taken. Organically deteriorated patients are typically most variable in their behaviour. Moreover the difficulty or familiarity of the task set must be taken into consideration when a subject's performance is being judged. Ability to respond to slight verbal cues on an "easy" task does not indicate that the subject will respond adequately to these same cues on a more difficult or unfamiliar one.

Senile decline, however, is not a single process. It does not reduce all sufferers to a common condition or necessarily affect all people in the same way. The ideal treatment and management of patients suffering from senile dementia depends on a full assessment of the disabilities in each case (Cosin *et al.*, 1957). Thus a patient whose memory is so impaired that recently perceived stimuli leave no appreciable effect is unlikely to profit from any training, however long and intensively this may be applied. Such a person, however, provided reasoning and judgment are well retained, may live happily and without causing a disturbance in a community where others with physical as opposed to mental disabilities can remind him constantly what to do. The patient with slight degrees of memory and intellectual deterioration can, however, often be assisted by mnemonics, and may even be trained to build up a system of these for himself.

The method of testing suggested and described here, being sensitive to such variations, has the additional advantage that it can often be used as a guide to treatment and management.

SUMMARY

A new test technique is described in which assessment of mental abilities is based on measurement of the amount and kind of "help" needed by subjects in order to solve standard tasks.

The results of a pilot investigation involving 36 old people from the United Oxford Hospitals' Geriatric Unit indicated that this technique gives considerable insight into the abilities of patients who fall outside the range of existing measuring scales. The test findings can also serve as a guide to the methods of treatment and management suited to individual cases.

The application of this technique to patients with speech disturbance is given special attention.

ACKNOWLEDGMENTS

Grateful thanks are due to the Nuffield Foundation and to Dr. L. Cosin, Medical Director of the United Oxford Hospitals' Geriatric Unit, for making these investigations possible.

BIBLIOGRAPHY

BABCOCK, H., *J. Psychol.*, 1941, **11,** 261.
BIRREN, J. E., *Old Age in a Modern World*, 1955. London: Livingstone, p. 235.
BRODY, M. B., *J. Ment. Sci.*, 1942, **88,** 512.
COSIN, L., MORT, M., POST, F. E., WESTROPP, C., and WILLIAMS, M., Manuscript in preparation, 1957.
MCFARLAND, R. A., and FISHER, M. B., *J. Geront.*, 1955, **10,** 424.
SZAFRAN, J. E., *Old Age in a Modern World*, 1955. London: Livingstone.
WECHSLER, D., *The Measurement of Adult Intelligence*, 1944. Baltimore: Williams & Wilkins.
WELFORD, A. T. (Ed.), *Skill and Age*, 1951. London: Oxford University Press.
WILLIAMS, M., *J. Neurol. Neurosurg., Psychiat.* 1953, **16,** 14.

APPENDIX

Material and Procedure of Test for Patients with Senile Mental Deterioration

Memory. Presentation of Stimuli. Exhibit pictures (Williams, 1953) one at a time preceded by following instructions: "I have some pictures here which I want you to look at. The pictures start off looking just like blots of ink, but as I turn over the pages they will change into pictures of animals. I want you to tell me as soon as you see what animal this one is turning into." At presentation of each stage, wait for patient's comment. As soon as correct animal is mentioned, say: "That's right, and this is what it looks like at the very end. Will you remember it, because later I am going to ask you what I showed you. Now here's another . . ." All instructions should be repeated as often as necessary.

Present three pictures for Recall and Recognition: Goose, Dog, Elephant.

Object Assembly Test. Material: "Manikin" and "Profile" from the W/B scale. Lay out pieces of each test on the table, and ask patient to put them together in his own time. Give following cues as necessary.

Grade	*Verbal*	*Mechanical*
1	Do you see what this is?	Point to piece or put it in S's hand.
2	This is nose (eye, head, leg, etc.).	Point to equivalent part of own or S's body.
3	It goes at the bottom (side, front, etc.).	Point to position on table.
4	Push it in (round) till it fits properly.	Make gesture to show correct orientation.
5	Yes, No, Stop (verbal guidance as S arranges piece).	Gestures of encouragement.
6	Let me show you—now you put it in.	Guide S's hand in correct direction.

Memory—Test. Ask patient, "Do you remember those pictures I showed you? What were they?" Give following cues as necessary:

Grade	*Verbal*	*Mechanical*
1	"They were pictures of animals."	Pick up booklets and show outside of each.
2	"Silhouette studies of common animals."	Show several pictures of animals including those originally exhibited.
3	(For Dog) You see them in all the streets. (For Goose) Eaten at Christmas. (For Elephant) Seen at Zoo.	Show booklets again and note points of recognition.

Matrices Test. Twelve items were selected from the Raven 1938 Matrices. A1, 4, 6, 7, B1, 2, 4, 9, D2, 4, 5, 6. The number of pieces from which selection had to be made was restricted in each case to 4 to avoid confusion. Give following cues to each item as necessary:

Grade	*Verbal*	*Mechanical*
1	Which of those bottom pieces goes into the space to complete the pattern?	Gestures from space to pieces at bottom.
2	It has got to have spots (lines etc.) all over.	Point to pattern in large matrix without accentuation.
3	This line goes . . .	Accentuate rhythm of matrix when pointing to it.
4	What you want here is the . . .	Point to equivalent pieces on matrix which is required below.
5	Don't you see a . . . there?	Point to piece required.
6	Put your finger here.	Take S's finger and place it on required piece.

EXPERIMENTAL STUDIES OF A PERCEPTUAL ANOMALY

VI. THE APPLICATION OF THE "PEEPHOLE" ANALOGY TO THE PERCEPTION OF "ORGANIC" PSYCHIATRIC PATIENTS

By

M. B. SHAPIRO, M.A., Ph.D.

Institute of Psychiatry (University of London), Maudsley Hospital

and

BARBARA TIZARD, B.A., Ph.D.

London Hospital

THE experiment to be reported in this paper stems from previous work on the block design rotation effect (Shapiro, 2, 3, 4; Yates, 9, 10; Williams, Lubin *et al.*, 7). As is well known, the block design test in its various forms: Kohs, Wechsler and Goldstein Scheerer, requires the subject to reproduce, with one-inch multi-coloured cubes, a series of abstract designs. It has been reported by a number of observers that subjects sometimes leave their reproductions in a rotated position, although otherwise the designs have been correctly reproduced. This is what we have called the block design rotation effect (Fig. 1).

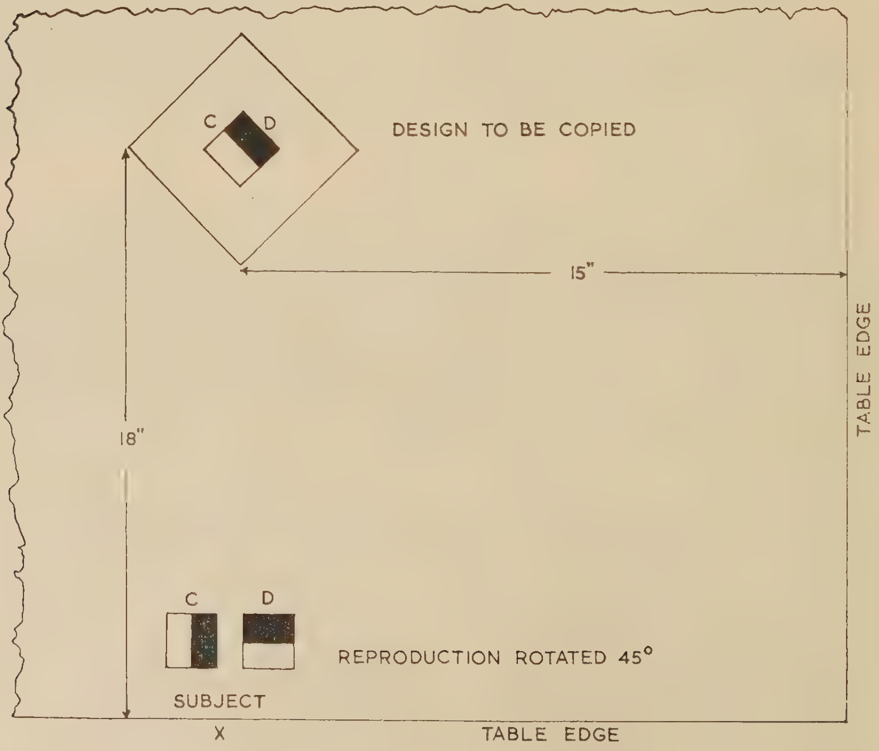


FIG. 1.—The block design rotation effect.

Work on this effect has resulted in two main findings. The first of these is that the block design rotation effect is produced to a greater degree by brain damaged than by non-brain damaged subjects. For the purpose of our investigation we regard as "brain damaged" subjects who have a history and/or symptomatology clearly consistent with the probability that cells and/or interconnective tissue of the brain have been destroyed.

The second finding is that the amount of rotation varies in accordance with certain laws of organization of the material which has to be copied. There are three such laws:

1. When the line of symmetry of the design to be copied is at an angle to the vertical axis of the visual field more rotation is produced than when it is parallel to that axis. The line of symmetry is the imaginary line which divides a design into two equal and mirrored halves.

2. When the design is in a diamond orientation, more rotation is produced than when it is in a square orientation.

3. When the card on which the design is placed is in a diamond orientation, more rotation is produced than when it is in a square orientation. The cards used in these experiments are white and each of them is 6 inches × 6 inches in size. The designs are each 1 inch × 1 inch in size.

The explanation formulated to account for these findings (Shapiro, 3) was derived from the following two propositions:

1. Brain-damaged subjects tend to exhibit an intensification of inhibitory effects in the remaining parts of the brain. The term inhibition is used in its strictly conventional sense as an active preventer of an excitatory potential which is present.

2. One of the necessary mechanisms of attention and adaptive behaviour is that of negative induction as defined by Pavlov (1). This is to the effect that when one part of the nervous system is excited, the remaining parts may be thrown simultaneously into a state of inhibition. The nervous system is, at any given time, subject to a considerable amount of simultaneous stimulation, both from external and internal sources. For behaviour to be adaptive the effects of a great part of this stimulation must be prevented from being effective. This notion is, of course, derived from Sherrington's idea of reciprocal inhibition (5).

From these two propositions it is possible to derive the hypothesis that in brain-damaged persons negative induction effects would tend to be overstrong. Such exaggerated negative induction would have the effect of excluding from consciousness stimulation which would be available to the non-brain damaged person.

It follows from such theorizing that, in the block design test situation, the position of the brain-damaged subject would be analogous to that of a normal person who is working in a dark room, and for whom the cards and the blocks are illuminated in turn. Let us suppose that the subject is looking at a diamond oriented design on a diamond oriented card, and that the line of symmetry of the design is at an angle to the vertical axis of the visual field. We can then apply some of the work that has been done on directional perception under conditions of restricted illumination (8), and surmise that one of the two upper sides of the design will be seen as the upper side of a diamond oriented square (Side C or D in Fig. 1). For similar reasons the card will be seen as a square, again with one of the two upper sides being seen as "top". One can also surmise that the line of symmetry will have directional properties which will reinforce the perception of the square.

When the subject has illuminated for him the blocks which he is to manipulate, he perceives a situation which has a different directional organization. Features like the table edge, the graining of the table surface, and the visible parts of his body might result in there now being only one "top". This will now lie straight ahead of him, and not at an angle, as it did in the card. He will construct, in this different directional situation, what he perceived on the card above, a square, and hence he would appear to have rotated. This is because the design which he is copying is, as we stated above, actually in a diamond orientation.

A clear deduction follows from this explanation: normal subjects would, if deprived of the necessary directional cues when doing the block design test, rotate as much as brain-damaged subjects and do so according to the same laws.

Experiments have produced evidence consistent with this expectation (4, 7 and 10). In these experiments normal subjects do the block design test under conditions of cue reduction, e.g. wearing a special cue-restricting mask and working on a table covered with black felt. The mask covers both eyes completely except for a hole about $\frac{1}{8}$ inch in diameter for the dominant eye. It should be noted that although the main evidence from these experiments confirms the expectation, the observations are not in strict accord with the formulation as it stands. For example, it is reported (7) that rotation is *lessened* when brain-damaged subjects do the block design test under conditions of cue restriction. In addition, the fact that many rotations are between 0° and 45° is difficult to account for in terms of the current formulation. Strictly speaking, they should all be 45°.

THE PRESENT EXPERIMENT

The experiment reported in this paper was designed to test the idea that the perceptions of a brain-damaged person are literally like those of a normal person peeping through a little hole. We have quoted elsewhere (4) Bleuler's remarks on the disturbances of association in organic cases, where he concludes by saying "the paretic peeps at the world through a small hole". What would be the consequence if one took such a theory literally? One of the outcomes would be that stimuli outside the "peephole" would not be available to the subject, while stimuli within the "peephole" would be.

As we reported above, the diamond oriented card produces more rotation than the square oriented card. If the size of the card were made very large, and hence its edges were outside the supposed "peephole", then the influence of card orientation should be lessened. Hence the difference in the amount of rotation produced by diamond and square oriented cards should be reduced. If the cards were made smaller, and their edges inside the "peephole", their influence on the directional perception of the subject should increase, because of their increased availability. The difference in the amount of rotation produced by diamond and square oriented cards should, therefore, increase. The prediction could be formulated in the following manner. The difference in degrees of rotation produced by diamond and square oriented cards should be greatest for small sized cards, next largest for medium sized cards, and smallest for large sized cards.

MATERIALS AND APPARATUS

A new test was devised to check our expectations. This consisted of 72 white cards, on each of which was drawn a yellow and blue design, 1 inch × 1 inch. Twenty-four of the cards were 6 inches × 6 inches in size. These were the dimensions of the cards used in the original experiments. Henceforth they will be called the 6-inch cards. Twenty-four of the cards were 12 inches × 12 inches in size and twenty-four were 3 inches × 3 inches. Henceforth these will be called the 12-inch cards and 3-inch cards. Each set of 24 cards contained the same six designs, presented in four different combinations of card and design orientation: (*a*) a square design on a square card, (*b*) a square design on a diamond card, (*c*) a diamond design on a square card, and (*d*) a diamond design on a diamond card. These designs were selected by eliminating two apparently easy and two apparently difficult designs from the original test. The six designs are illustrated in Figure 2 in both their diamond and square orientations. It will be seen that there are two types of designs: (*i*) designs of diagonal symmetry, in which the line of symmetry forms a diagonal, and (*ii*) designs of rectangular symmetry, in which the line of symmetry divides the design into two equal rectangles.

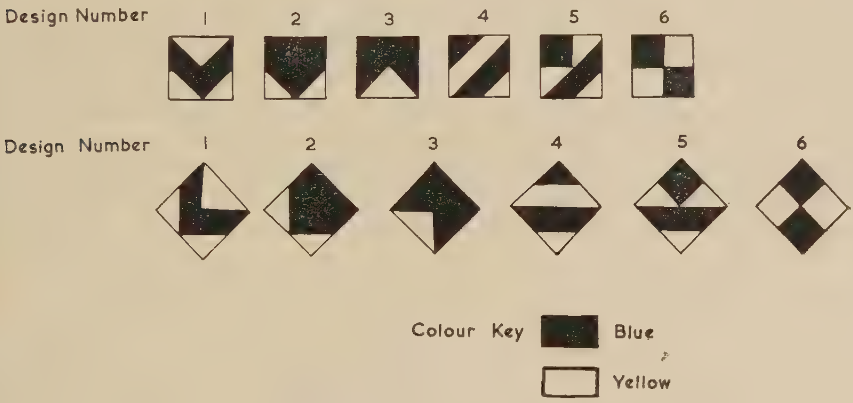


FIG. 2.—Showing the designs in the two orientations used.

The only additional equipment for this experiment was a camera suspended in a clamp above the table in such a way that it was possible to photograph each reproduction. The distance from the centre of each card to the edge of the table adjacent to the subject was 18 inches, and to the edge on the subject's right hand was 15 inches (see Fig. 1).

PROCEDURE

The test was given to each subject in two separate sessions, one week separating each session. This was done to avoid over-fatiguing the patients. Each session lasted about 45 minutes. Each patient did all 36 versions of Designs 1, 2 and 3 at one session, and of 4, 5 and 6 at the other. Alternate patients were presented with alternate groups of designs first. The order in which the cards were presented within each session was determined by randomization within groups. Each card was selected by randomizing separately the size of card, the design, and the combination of Design and Ground, using a table of random numbers. In all other respects the procedure was the same as that reported by Shapiro in previous papers (2, 3 and 4).

A time limit of three minutes was observed, and at the end of each trial the subject was asked if his reproduction was correct. The time taken was recorded. The amount of rotation was measured by photographing each reproduction immediately after it was completed. The angles of rotation were measured later on the projected film.

SUBJECTS

The subjects, 20 in number, attended either the Maudsley Hospital or Springfield Hospital, Tooting. Since it was not possible to find, in the time available, sufficient patients in these hospitals who were unequivocally brain damaged and capable of completing the test, five idiopathic epileptics were included in the sample. It is of interest that their mean rotation score (11·72) is nearly as high as that of the group as a whole (13·19). The mean age of the group was 40·35 years, with a range from 20 to 60. The mean prorated Full Scale I.Q. on a shortened form of the Wechsler (Block Design, Vocabulary and Similarities) was 82·6, with a range from 63 to 114. Ten of the patients had a Weighted Vocabulary score of less than 6 points, and 8 were over 45 years of age. None of the patients in the previous samples had been more than 45 years of age, or had Weighted Vocabulary scores of less than 6 points. These differences from previous samples were not considered to be important, as our main concern was the experimental manipulation of the rotation effect, and not the finding of differences between brain-damaged and other groups. The main clinical data concerning these patients are given in Table I.

TABLE I
Experimental Subjects

No.	Age	Sex	Diagnosis	Mean Rotation Score
1	27	F	Idiopathic epilepsy	19·5
2	57	F	Arteriosclerotic dementia	14·2
3	31	M	Left temporal lobectomy	10·9
4	36	M	Huntington's chorea	22·9
5	20	M	Post-encephalitic dementia ..	11·8
6	40	M	Post-encephalitic Parkinsonism ..	4·1
7	20	M	Idiopathic epilepsy	17·8
8	36	M	Idiopathic epilepsy	6·6
9	51	F	Spastic paraplegia	14·5
10	50	F	Post-encephalitic Parkinsonism ..	25·4
11	54	F	Dementia paralytica	16·6
12	36	M	Dementia paralytica	13·8
13	60	F	Organic psychosis	17·3
14	32	M	Idiopathic epilepsy	5·3
15	42	M	Post-encephalitic Parkinsonism ..	16·6
16	29	M	Post-encephalitic dementia ..	4·6
17	59	M	Arteriosclerotic dementia	8·6
18	40	M	Idiopathic epilepsy	9·4
19	48	F	Dementia paralytica	9·4
20	49	F	Dementia paralytica	19·2

RESULTS

We first of all obtained three sets of scores for each subject. These consisted of the difference in rotation between diamond and square oriented cards for (*i*) the 12-inch cards, (*ii*) the 6-inch cards, and (*iii*) the 3-inch cards. Henceforth these particular scores will be referred to as difference scores. The means, standard deviations and ranges are shown in Table II.

TABLE II

Difference Scores for the Three Sized Cards

	3-inch Cards	6-inch Cards	12-inch Cards
Mean difference scores	24·55	32·50	6·37
Standard deviations ..	54·27	49·41	51·57
Ranges	−85 to +116	−75 to +108	−125 to +66

At first sight it would seem that the results are not wholly inconsistent with expectation. The mean difference score for the 12-inch card appears to be considerably smaller than it is for the 3-inch cards and the 6-inch cards, while the difference between the 6-inch and 3-inch cards is relatively small. These results could be due to the fact that the "peephole" used by these patients is, on the average, big enough to encompass the 6-inch card, and therefore it is also big enough for the 3-inch card. However, an analysis of variance only produced an F of 1·381. An F of 3·28 is necessary to reach the 5 per cent. level of significance. We have to conclude that the observations we have made could easily have arisen by chance, and cannot be accepted as evidence for the theory we were testing.

We next considered whether the negative findings might be a consequence of the character of our sample, and the fact that we were using new test material and procedures. Such an explanation is contra-indicated by the fact that the three laws are still operating on the whole in the same manner as they did in Shapiro's earlier studies. The difference between the angled line of symmetry and the vertical line of symmetry gave a "t" of 6·04, which was well above the ·001 level on a one-tail test. The difference between the diamond oriented design and the square oriented design gave a "t" of 2·437, which was significant at the 0·25 level on a one-tail test. This difference was less than that reported by Shapiro (3). The orientation of the card also produced the same differences as had been found before, the diamond oriented card producing more rotation than the square oriented card. The difference was significant at the ·025 level on a one-tail test. This difference was only slightly less than that reported by Shapiro. On the whole one can say that the three laws are operating strongly enough to prevent us from concluding that the new conditions of experimentation were responsible for our negative findings.

FURTHER INVESTIGATION OF THE DATA

It will be remembered that the difference between the diamond and square oriented cards only reached the ·025 level of significance (one-tail test) for all the designs combined. However, an analysis of variance reported by Tizard (6) showed that the orientation of the card only influences the amount of rotation in certain kinds of design. This second-order interaction is shown in Table III.

TABLE III

Second Order Interaction Table

Total Amounts of Rotation for Different Combinations of Card and Design

Type of Design	Square Card	Diamond Card
Designs of Rectangular Symmetry:		
1. Square designs	671	705
2. Diamond designs	4,214	4,482
Designs of Diagonal Symmetry:		
1. Square designs	1,530	2,398
2. Diamond designs	1,472	1,446

It will be seen that large differences between square and diamond oriented cards occur only when the line of symmetry is at an angle to the vertical axis of the visual field. Under these conditions designs with diagonal symmetry produce the most significant difference, reaching the ·0005 level (one-tail test), and the designs with rectangular symmetry produce a weaker difference, reaching the ·025 level (one-tail test). The remaining types of design produced differences between the square and diamond oriented cards which did not approach an acceptable level of significance.

It was, therefore, of interest to see whether our expectations concerning the effect of card size would still be negatived for those cards where the effect of card orientation is maximal, i.e. designs of diagonal symmetry in a square orientation. The means, standard deviations, and ranges are given in Table IV.

TABLE IV

Difference Scores for the Three Sized Cards: (i) *for Designs of Diagonal Symmetry in a Square Orientation;* (ii) *for Designs of Rectangular Symmetry in a Diamond Orientation*

	3-inch Cards	6-inch Cards	12-inch Cards
Means:			
(i)	21·47	24·78	4·26
(ii)	4·11	4·84	5·15
S.D.:			
(i)	41·58	32·13	35·91
(ii)	28·62	34·83	41·04
Ranges:			
(i)	−51 to +103	−24 to +95	−73 to +60
(ii)	−43 to +63	−63 to +66	−81 to +71
t's:			
(i)	2·646	3·04	0·70
(ii)	0·777	0·683	0·665

An analysis of variance was carried out on these designs. This produced an F of 2·543. An F of 3·26 would have been necessary to reach the ·05 level. As the direction of the differences was predicted, it seemed permissible to calculate t tests. The difference scores for the 6-inch cards were larger than those for the 12-inch cards, t being 2·131. This, on a one-tail test, is significant between the ·025 and the ·01 level. The difference scores for the 3-inch cards were also larger than those of the 12-inch cards. The t was 1·752, which is significant between the ·025 and the ·05 level on a one-tail test.

We next calculated t's for the differences between square and diamond oriented cards for each of the three sizes of cards of this type of design (see Table IV). The differences reached an acceptable level of significance for the 3-inch and 6-inch cards, but not for the 12-inch. That is, the effect of card orientation is not simply less in the largest cards; it tends to disappear.

A similar analysis was now necessary for the designs of rectangular symmetry in a diamond orientation. These had provided an overall difference between cards in a square and diamond orientation at the 5 per cent. level of significance. An examination of Table IV shows that the mean difference scores do not vary with size of ground. This result is inconsistent with our expectation. When, however, we examine the differences between diamond and square oriented cards for each size of card in designs of this type, none of the differences reach an acceptable level of significance (see Table IV). The highest of the 3 "t's" was 0·777. A "t" of 1·73 is necessary for the 10 per cent. level to be reached. If the orientation of the card is having no effect for each size of card, it is hardly likely that the different sizes of card will differ from each other in the effect of card orientation. The fact that, when the three sizes of cards combined, there is a difference at the ·025 (one-tail) level between the diamond and square orientation, must be due to the summed effect of small but consistent differences.

Discussion and Conclusions

An unexpected outcome of this experiment is the finding that the strength of the effect of ground is a function of the type of design which is being reproduced. It is the designs in which the line of symmetry is at an angle to the vertical axis of the visual field where the effects of ground are greatest. A possible explanation of this observation might be along the following lines. In our conditions the angle of the line of symmetry is a powerful determinant of directional perception. When it is parallel to the vertical axis of the visual field it produces a directional percept which is reinforced by all the other internal and external stimulation reaching the subject. The percept thus produced would be relatively stable. It would be less likely to be affected by a single and relatively weak anomalous directional cue like the diamond orientation of the card. When, however, the angle of the line of symmetry is at an angle to the vertical axis of the visual field, it is producing a directional percept which is out of harmony with the rest of the incoming stimulation. The percept thus produced might therefore be relatively unstable and the balance would easily be tipped by rather weak cues, like the orientation of the card.

The balance could be made even more precarious by the directional properties of the outline of the design. In the designs of diagonal symmetry in a square orientation, the orientation of the design reinforces the "reality cues", while in the designs of rectangular symmetry in a diamond orientation, the orientation of the design reinforces the effects of the line of symmetry. As a result, the first kind of design might be much more unstable than the second, and hence affected much more by differences in the orientation of the card as a whole.

These considerations serve to give more confidence to our findings, for they suggest a systematic reason for our observation that the orientation of the card affects rotation in some designs and not in others. On the other hand, this suggestion is at such a low level of generality that it is of limited use as it stands. The fundamental question still remains as to how the different aspects of a situation can combine to produce a certain percept. This is one of the fundamental questions of psychology, and for the time being at any rate, we have no answer to it.

At our present level of theorizing, however, it seems that our results are consistent with the notion that the perceptions of an organic psychiatric patient are similar to those of a normal person looking through a small hole. In this case the "hole" seems to be large enough to encompass a 6-inch but not a 12-inch card that is lying 18 inches away from the edge of a table at which the subject is sitting.

Summary

This paper describes an experiment to test the theory that the perceptions of organic psychiatric subjects are similar to those of normal subjects who are looking at the world through a small hole. The experiment was carried out on 20 brain-damaged and epileptic subjects. They were required to reproduce abstract designs with Kohs Blocks, the designs

being painted on 3 inch, 6 inch and 12 inch square cards. The same designs appeared on each set of cards.

Previous experimentation with 6 inch cards had shown that diamond oriented cards produced more rotation of the reproductions than did the square oriented cards. It was hypothesized that the edges of the 12 inch card were likely to be further outside the supposed peephole than those of a 6 inch card, which in turn would be further outside the hypothesized peephole than those of a 3 inch card. The further outside the peephole edges the card, the less likely would the orientation of that card be to influence the amount of rotation, and hence the smaller would be the difference between diamond and square oriented cards. Whilst the results may be regarded as consistent with expectation, they need to be repeated before the theory can be considered to have been reliably confirmed.

ACKNOWLEDGMENTS

To Dr. D. Leigh and Dr. F. Post of the Maudsley Hospital for allowing us to test their patients; to Dr. H. C. Beccle, Physician Superintendent of Springfield Hospital, Tooting, for his kindness in granting facilities for the experimental work and for his help in the selection of patients; to Mr. A. S. C. Ehrenberg for his valuable help in designing the experiment, and to Dr. A. E. Maxwell for help with the statistical analysis.

REFERENCES

1. Pavlov, I. P., *Conditioned Reflexes*, 1927. London: Oxford University Press, 1946 (trans. Anrep).
2. Shapiro, M. B., "Experimental Studies of a Perceptual Anomaly. I. Initial Experiments", *J. Ment. Sci.*, 1951, **97,** 90–110.
3. *Idem*, "Experimental Studies of a Perceptual Anomaly. II. Confirmatory and Explanatory Experiments", *ibid.*, 1952, **98,** 605–617.
4. *Idem*, "Experimental Studies of a Perceptual Anomaly. III. The Testing of an Explanatory Theory", *ibid.*, 1953, **99,** 394–409.
5. Sherrington, C., *The Integrative Action of the Nervous System*, 1947. Cambridge University Press.
6. Tizard, B., *A Theoretical and Experimental Study of the Relations between Higher Mental Processes and Brain Integrity*, 1957. Unpublished Ph.D. Thesis, University of London Library.
7. Williams, H. L., Lubin, A., Gieseking, C., and Rubinstein, I., "An experimental study of block design rotation in brain-injured and controls", *J. Consult. Psychol.*, 1956, **20,** 275–280.
8. Witken, H. A., and Asch, S. E., "Studies in Space Orientation. IV. Further Experiments on Perception of the Upright with Displaced Visual Fields", *J. Exp. Psychol.*, 1948, **38,** 762–782.
9. Yates, A. J., "Experimental Studies of a Perceptual Anomaly. IV. The Effect of Monocular Vision on Rotation", *J. Ment. Sci.*, 1954, **100,** 975–979.
10. *Idem*, "Experimental Studies of a Perceptual Anomaly. V. Some factors influencing the Appearance of the Block Design Rotation Effect in Normal Subjects", *ibid.*, **102,** 1956, 761–771.

DIMENSIONAL THEORY APPLIED TO SCHIZOPHRENIC PATIENTS

By

J. G. THORPE, Ph.D.
Research Psychologist

and

A. A. BAKER, M.D., D.P.M.
Deputy Physician Superintendent
Banstead Hospital, Sutton, Surrey

PROBLEM

PSYCHOTICISM, neuroticism, and extraversion are the dimensions of personality resulting from the statistical analysis of a number of psychological tests. Those working in this field state that the "isolation of three main dimensions—neuroticism, psychoticism, extraversion—may be said to have been accomplished at a reasonably high level of confidence" (Eysenck, 1952, p. 293). It has been stated also that these dimensions are relatively independent of one another and all independent of intelligence. In developing the dimensional picture of personality, tests which discriminated between a group of neurotic patients and a group of normals were found to inter-correlate positively and to generate a factor of neuroticism. Similarly tests were developed which distinguished between psychotic patients and normals, and between extraverts and introverts. To the writers' knowledge however there is no study available which applies the tests for all four dimensions to the same group of people. The four orthogonal dimensions should be identifiable, and would confirm the dimensional theory.

At Banstead Hospital we have been developing various methods of assessing schizophrenic patients, and have described the use of various rating scales and standard interviews. In one research project we had the opportunity to assess the value of the dimensional approach described above, in a group of schizophrenic patients. We hoped to discover if the four dimensions described could be isolated in our patients and if, when isolated, they could be related to clinical findings or prognosis. The first aim of this paper is therefore the test of the four-dimensional theory.

Secondly, the degree to which a test will discriminate between psychiatric and normal groups depends as much upon the groups as on the test itself. As the psychiatric groups, particularly the psychotic ones, in these studies were generally less severely disturbed than is usually found in mental hospitals, the question of how mental hospital patients would perform on the various tests is of obvious importance. The second aim of this paper is to provide data for these comparisons.

Thirdly, we have shown elsewhere (Baker, Game and Thorpe, 1957) that schizophrenic patients, after three months' physical treatment, show marked improvement in behaviour and loss of their schizophrenic symptoms. It would therefore be instructive to determine the changes (if any) in the dimensional positions of these patients after such treatment. In this connection we may draw attention to the work of Petrie (1952) who demonstrated that neurotic patients after leucotomy showed a decrease in neuroticism together with an increase in extraversion, and a decrease in intelligence. These findings were confirmation of three separate hypotheses, and the investigation followed the lines of the hypothetico-deductive method. In our case, however, we have not found it easy to predict the dimensional outcome following treatment and have had to resort to the null hypothesis for each dimension, that is, we have tested, for each dimension, the hypothesis that *no* significant change would appear after treatment.

Finally, we can investigate the prognostic value of the dimensional positions occupied by our patients before treatment was started. An investigation along these lines was carried out in 1955 by Keehn using psychotic patients and the single dimension of psychoticism. Keehn concluded that "no consistent relationship between pre-treatment scores and degree of recovery was found; on half the (psychoticism) tests the recovered group were less psychotic than the non-recovered group and on the other half more so" (*idem*, p. 877). In the present study, all four dimensions are included.

METHOD

(*a*) SUBJECTS

Thirty-five female patients were included in the study. All were:

(*i*) Under 40 years of age with no evidence of previous physical treatment for schizophrenia.

(*ii*) Considered to be schizophrenic by three doctors including two consultants·

(*iii*) Sufficiently co-operative before treatment to do all the tests.

(*iv*) Sufficiently co-operative after treatment to do all the tests.

(*b*) TESTS

The following tests were given individually by one of the authors (J.G.T.). The scoring units are given in parentheses.

(i) *Intelligence*

1. Raven's Progressive Matrices (I.Q.).
2. The synonym version of the Mill Hill Vocabulary Scale (I.Q.).
3. The Nufferno Level Test. Two cycles only were given. (Total number of correct responses.)
4. The Nufferno Speed Test. Form AA normal speed. Form AB stressed, individual timing. (Mean log time for correct responses.)

(ii) *Neuroticism*

1. The Body Sway Test of Primary Suggestibility. The suggestion was given verbally and the score was the maximum displacement from the vertical in the forward or backward direction, whichever was larger. ($\frac{1}{4}$-inch units.)
2. The Static Ataxia Test. The score was the sum of the maximum displacements in the forward and backward directions. ($\frac{1}{4}$-inch units.)
3. Track Tracer. Six trials were given and timed. (Mean time per trial in seconds.)

4. Track Tracer. The number of errors made was counted for each trial. (Mean error per trial.)
5. Personal Tempo. Triangles were drawn at preferred speed for three trials of 15 seconds each. (Mean number per trial.)

(iii) *Introversion-Extraversion*

1. Speed/Accuracy. Scores were derived from the Time and Error scores of the Track Tracer in order to measure the Speed/Accuracy ratio.
2. Humour. The patient was required to arrange six cartoons in order of humour value, three of which were sexual and three non-sexual. A score was derived which was a measure of preference for sexual humour.
3. Verbal/non-Verbal Intelligence Ratio. This was obtained from the Mill Hill and the Progressive Matrices I.Q.s above.
4. Leg Persistence. (Seconds.)

(iv) *Psychoticism*

1. Measuring distances. Distances of 8 inches, 1 foot, and 2 feet were estimated. The total error was assessed. (Inches.)
2. Writing "Year". The length of writing was measured. (Millimetres.)
3. Three Circles. The largest diameter was measured. (Millimetres.)
4. Three Squares. Ditto for the diagonal. (Millimetres.)
5. Tapping. Normal tempo. One trial of 15 seconds.
6. Waves. Four sets of waves were drawn. The average length of each set was the score. (Millimetres.)
7. Half-crown. The largest diameter was measured. (Millimetres.)

Detailed descriptions of all these tests have been given elsewhere (Eysenck, 1947, 1952). The tests were given in the ward clinic and most of the patients completed them all in about two hours. There was no break during testing. None of the patients had been given any drugs on the day of testing.

(*c*) TREATMENT AND RETESTING

When testing was completed, the patients were given one of three courses of physical treatment—20 electric convulsions, 30 insulin comas, or 8 weeks' treatment with chlorpromazine, based on a random selection procedure (Baker, Game and Thorpe, 1957). One week after completion of treatment all patients were retested on all the tests. They were also seen by one of us (A.A.B.) who decided whether they could be discharged home, or whether further treatment was necessary.

RESULTS

We will first of all consider the inter-correlations of the above tests. Table I gives the tetrachoric correlations between the scores obtained both before and after treatment, and in future Tables each test will be represented by the number given to it here.

The mean scores in all the tests have been adjusted so that higher scores represent more intelligence, more neuroticism, more psychoticism and more

TABLE I

Tetrachoric Correlations Between Scores Before Treatment (above diagonal) and After Treatment (below diagonal) (N=35). Decimal Points Omitted

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. Static Ataxia		48	10	60	−04	−72	−38	−03	20	−23	−60	−18	10	−58	03	26	42	10	28	−44	27
2. Body Sway	48		04	53	67	−35	−56	−33	−00	−22	−30	−27	−03	−38	02	13	25	30	19	−30	30
3. Tr. Tr. Time ..	−43	10		−43	32	−32	−48	−29	−13	−19	77	−27	53	−40	02	−26	−05	05	08	−26	−18
4. Tr. Tr. Error ..	37	00	−16		30	−47	−26	−02	54	−03	−55	−70	−22	−38	00	33	19	30	58	−12	48
5. Triangles	10	−14	−10	00		−40	−26	−24	65	−10	20	−26	−05	−24	10	12	−40	08	27	−10	00
6. Mill Hill	34	14	11	−47	14		67	−07	−32	45	30	20	38	10	10	00	−22	22	−30	−24	−46
7. P. Matrices	12	09	−33	−37	−04	54		−58	−63	70	08	30	−40	−03	−20	26	20	48	−17	05	−12
8. Speed AA	−05	00	−15	−30	30	78	−10		48	−30	33	41	−40	56	25	52	30	−30	−34	40	30
9. Speed AB	−10	−40	−34	14	72	46	−23	92		−20	−24	17	29	30	−29	−18	−40	−24	24	46	18
10. Level	26	19	40	−61	−20	91	75	80	34		−18	20	−10	05	13	10	42	53	−40	−12	36
11. Speed/Accuracy ..	−53	01	70	80	17	08	00	12	−35	14		43	05	18	−03	10	−12	−12	−38	−12	−43
12. Humour	51	03	−17	30	50	−07	−10	−46	−24	−14	−10		02	37	−20	28	−12	−20	−65	27	12
13. Vbl./N.Vbl. ..	10	−16	−10	−11	12	20	−63	56	64	−03	18	00		−30	30	00	03	−22	−32	−20	−22
14. Leg. Persist. ..	42	50	−33	37	30	−21	15	−30	−14	−48	−37	14	−38		19	−33	−07	−17	−32	60	05
15. Distances	−26	−70	−33	−08	08	−20	−49	28	00	−48	22	−30	46	24		−10	33	−40	00	−10	03
16. Year	20	20	−48	−30	09	04	15	00	−10	00	09	14	30	24	24		30	30	−03	10	34
17. Circles	42	10	−18	−48	51	10	34	14	10	42	24	36	30	10	−16	30		82	−23	07	82
18. Squares	23	−20	−38	−27	30	14	−06	05	12	02	00	56	50	10	10	30	90		20	−07	48
19. Tapping	17	−48	−16	−25	39	07	00	57	−10	00	31	−22	−05	02	54	−32	−18	03		−03	−48
20. Waves	−54	−28	−04	−38	58	−28	26	60	44	12	30	25	−24	07	−07	40	−20	−20	22		05
21. 2/6d.	−13	−50	−43	18	30	−60	−20	−83	−80	−63	22	54	−10	21	60	40	24	43	−07	−06	

introversion. Table II shows the average of these correlations for both within and between the dimensions for the pre- and post-treatment scores separately.

TABLE II

Average Correlations Within and Between Dimensions

	Pre-treatment				Post-treatment			
	Neuroticism	Intelligence	Introversion	Psychoticism	Neuroticism	Intelligence	Introversion	Psychoticism
Neuroticism ..	(·26)	—·18	—·20	·10	(—·008)	—·02	·09	—·09
Intelligence ..	—·18	(·02)	·12	·04	—·02	(·52)	—·06	—·02
Introversion ..	—·20	·12	(·13)	—·08	·09	—·06	(—·09)	·17
Psychoticism ..	·10	·04	—·08	(·11)	—·09	—·02	·17	(·16)

The factorial picture is given in Table III which shows the loadings on the four centroid factors which were extracted from the pre-treatment correlation matrix given in Table I. The fourth factor residuals appear in Table IV.

TABLE III

Centroid Solution for Pre-Treatment Correlation Matrix Given in Table I
(Decimal points omitted)

Test No.	Factor I	Factor II	Factor III	Factor IV
1	769	102	—261	—002
2	811	056	—223	—121
3	282	061	522	—721
4	713	139	—404	392
5	359	424	—048	—218
6	—626	—296	497	199
7	—289	—525	288	528
8	—198	—281	—718	—326
9	—042	484	—684	—228
10	—102	—604	064	307
11	—377	—001	—251	611
12	—680	—115	—259	—204
13	—026	121	330	—347
14	—623	—106	—401	—002
15	034	—160	126	—008
16	140	—271	—149	—002
17	391	—908	—222	—100
18	399	—551	—011	024
19	513	517	101	241
20	—357	—016	—497	—157
21	388	—493	—632	137

TABLE IV

Fourth Factor Residuals
(Decimal points omitted)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1.		−238	014	067	−329	079	029	−036	−011	073	−232	287	018	−193	−055	141	154	−152	142	−293	086
2.			−166	102	318	−310	172	−342	−173	052	−012	205	029	052	−029	−002	−080	002	170	−140	128
3.				145	063	241	136	123	045	−164	305	−089	125	−010	040	−205	036	−040	−024	−013	−171
4.					−051	−051	−072	002	316	−056	−060	225	−096	081	046	−206	015	−098	189	001	−037
5.						−017	−196	−155	372	−386	214	−024	−043	011	−166	178	−191	166	076	−023	−070
6.							106	−145	−192	114	−060	071	−133	122	009	−082	115	−317	075	188	−076
7.								406	004	074	−202	−010	384	150	−314	−212	047	−332	093	−003	−141
8.									053	344	236	−010	−214	118	−305	364	−070	−392	−057	−083	169
9.										−212	−212	−026	496	051	124	−145	−132	012	−136	107	−034
10.											047	−141	087	051	023	039	043	−274	−116	086	086
11.												115	−255	044	044	189	022	018	068	−226	031
12.													003	170	155	−444	−035	000	165	−136	−194
13.														−198	−241	019	−032	−281	223	−100	013
14.															−244	−332	−011	017	−096	176	013
15.																129	−201	500	054	027	018
16.																	−033	093	−053	062	204
17.																		162	−085	074	−094
18.																			−292	053	−039
19.																				−249	−393
20.																					211
21.																					

Table V gives the projections of the extended centroid factors on the Landahl axes L M N O.

TABLE V

Projections of the Extended Centroid Factors on the Landahl Axes

Test No.	L	M	N	O
1	·391	·738	·266	·602
2	·322	·747	·403	·429
3	2·182	−·596	·039	·745
4	·589	·606	−·156	·961
5	·720	1·461	·146	·327
6	·181	1·293	·026	·501
7	−·003	2·820	·007	·824
8	3·846	−·426	·781	−1·200
9	10·595	−16·119	11·691	·834
10	1·643	5·280	−1·269	−4·152
11	·024	·979	1·642	−·645
12	·925	·244	·456	·375
13	−1·500	−2·154	−10·192	15·846
14	·909	·262	·734	·095
15	−·118	−4·589	4·824	·883
16	−1·007	·071	·943	1·993
17	−1·073	−·249	1·505	1·817
18	−·174	−·206	1·147	1·234
19	1·338	·671	−·140	·133
20	1·438	−·393	·954	·001
21	−·773	·503	·144	2·127

The means and standard deviations obtained by our patients on all the tests are given in Table VI (page 808) together with the means and standard deviations obtained by Eysenck's groups on similar tests.

The changes in test scores following treatment are summarized in Table VII together with the statistical significance of these changes.

TABLE VII

Changes in Test Scores Following Treatment

	Change	“t” (related means)	“p”		Change	“t” (related means)	“p”
Intelligence				Neuroticism			
Mill Hill	+	3·97	·01	S. Ataxia	−	1·93	Near ·05
P. Matrix	+	5·91	·01	B. Sway	−	3·29	< ·01
Speed AA	+	1·53	NS*	Tr. Tracer Time	−	3·61	< ·01
Speed AB	+	·25	NS	Tr. Tracer Error	+	1·40	NS
Level	+	4·44	·01	Triangles	−	2·91	< ·01
Introversion				Psychoticism			
S/Acc.	+	·61	NS	Distances	−	·01	NS
Humour	+	·38	NS	Year	−	·17	NS
V/N.V.	−	·35	NS	Circles	+	·42	NS
Leg.	−	·12	NS	Squares	−	·86	NS
				Tap	+	1·7	NS
				Waves	+	1·4	NS
				2/6	+	·57	NS

* NS = Not significant.
+ = More intelligence, more introversion, etc.
− = Less intelligence, less introversion, etc.

TABLE VI

Means and Variances

	Present Study (N=35)				Eysenck's Study[1]				Eysenck's Study[2]			
	Pre-Treatment		Post-Treatment		100 Neurotics		200 Normals		100 Normals		50 Schizophrenics	
	Means	Variances	Means	Variances	Means	Variances	Means	Variances	Means	Variances	Means	Variances
Static Ataxia ..	6·1	41	3·4	7	7·5	18	5·6	7	3·2		4·0	
Body Sway ..	6·7	28	5·4	19	22·3	784	14·6	376				
Tr. Tr. Time ..	277·3	8,783	238·9	4,114								
Tr. Tr. Errors	27·6	301	27·2	409								
Triangles ..	9·4	36	12·7	63								
Mill Hill ..	89·6	276	91·7	287								
Matrices ..	81·6	169	95·2	900								
Speed AA ..	1·336	·038	1·212	·047								
Speed AB ..	1·186	·042	1·101	·117								
Level	3·1	6	5·0	7								
Speed/Accuracy	1·5	·3	2·8	·3								
Humour ..	6·3	4	6·4	3								
Vbl./N.Vbl. ..	1·2	3	·9	·8								
Leg Persistence	47·1	2,734	43·5	906	48·8	1,302	60·2	1,184	112·7	4,558	104·1*	7,266
Distances ..	5·3	7	5·1	7	5·8		5·1		4·1	9	6·6	32
Year	24·6	244	24·0	114					29·0	204	39·3	915
Circles ..	37·0	412	36·2	462	42·1	502	41·5	703	19·7	182	29·5	553
Squares ..	45·2	637	38·5	436	49·6	828	46·1	838	26·9	324	40·9	1,026
Taps	38·6	500	35·8	286	71·1	332	69·8	37	75·7	184	66·7*	261
Waves ..	100·1	1,271	108·0	1,924	95·9	641	100·2	509	89·0	441	100·0	744
2/6	35·6	44	35·4	69	35·9	33	35·1	36	32·3	26	36·9	65

[1] Reported in the *Scientific Study of Personality*, p. 124.

[2] Reported in the *Scientific Study of Personality*, p. 216.

* These means are significantly different ($p < \cdot 01$) from the present study schizophrenic means for both before and after treatment.

The omissions in this Table are due to differences in equipment, etc., from study to study.

Lastly, the pre-treatment scores of two groups of patients are compared. The two groups are made up of those of the thirty-five patients who were able to be discharged following treatment and who have not since relapsed to hospital either as out-patients or in-patients, and those who needed further treatment and/or have since relapsed. These scores are given in Table VIII together with the statistical significance of the differences in means.

TABLE VIII

Means and Standard Deviations for Pre-treatment Scores of Two Groups of Patients

	"Recovered" (N=11)		Not Recovered (N=13)		"P"
Test No.	Mean	Variance	Mean	Variance	
1	3·82	22·1	7·91	60·7	NS*
2	5·20	33·6	8·15	27·1	NS
3	270·15	1,8951·7	317·92	1,5867·2	NS
4	26·09	250·6	27·72	279·1	NS
5	10·61	35·6	7·75	15·7	NS
6	79·02	165·8	82·50	194·5	NS
7	76·59	1,943·2	79·08	253·4	NS
8	1·303	·044	1·309	·056	NS
9	1·081	·041	1·148	·069	NS
10	2·47	4·8	3·00	5·7	NS
11	1·55	·201	1·46	·279	NS
12	5·48	5·9	6·47	4·4	NS
13	1·09	·742	0·93	·821	NS
14	56·25	858·51	32·26	894·02	Near ·05
15	4·64	114·7	5·52	213·1	NS
16	24·57	98·6	20·23	81·7	NS
17	33·71	525·1	35·02	579·2	NS
18	43·68	609·5	38·53	503·1	NS
19	36·82	109·5	33·06	425·9	NS
20	105·00	1,140·0	91·87	983·1	NS
21	34·34	69·5	36·24	85·4	NS

* NS=Not significant.

DISCUSSION OF RESULTS

(i) *The Existence of the Personality Dimensions*

As the mean scores in all the tests were adjusted to measure more intelligence, more neuroticism, more psychoticism and more introversion, and as Eysenck claims that these dimensions have independent reality, it follows that the correlations between the tests, both before and after treatment, should show the following pattern (Fig. 1).

FIG. 1

	Neuroticism	Intelligence	Introversion	Psychoticism
Neuroticism	+ve	Zero	Zero	Zero
Intelligence	Zero	+ve	Zero	Zero
Introversion	Zero	Zero	+ve	Zero
Psychoticism	Zero	Zero	Zero	+ve

If we compare our actual findings in Table II with this, we find that our expectation is not borne out. The pre-treatment matrix shows average correlations between the various groups of tests which are in some cases higher than the average correlations within some of the groups. This suggests that the existence of the four independent dimensions is at least in some doubt. The same conclusion is suggested by the pattern of correlations formed by the scores after treatment, also shown in Table II. Although the intelligence tests now show a clear-cut cluster with an average inter-correlation of over ·5, it will be seen that the average for the neuroticism cluster has dropped from + ·26 to a negative value, which does little to support the concept whose label it bears. Again, there are numerous instances of the correlations between the dimensions being greater than those within the dimensions.

The possibility exists, of course, that the dimensions can be isolated from these data if departure from strict orthogonality is permitted. In order to test this possibility, the pre-treatment correlation matrix was factored by the centroid method, and four factors were extracted. The factor solution appears in Table III. An attempt to reach simple structure was made by the method of extended vectors, and Landahl projections, The table of projections on the Landahl axes (Table V) is given for those readers requiring the diagrams for plotting these projections. A study of these diagrams indicated quite clearly that no unique simple structure solution could be achieved. The post-treatment matrix was treated in the same way with the same result.

We may therefore conclude that our data lend no support to the four-dimensional theory. We can find no evidence supporting the existence of these four dimensions even if we disregard the claim for orthogonality. This conclusion must not be considered definitive—there are too many shortcomings in the present data for that, among them the nature and size of our sample, and our use of an initial correlation coefficient which is comparatively easily calculated, though some accuracy has inevitably been sacrificed. The present study has shown the need for a similar study, testing all four dimensions on the same group of subjects, with a better selection of tests for the various dimensions than we, with our limited laboratory equipment, have been able to achieve.

(ii) *The Scores of Schizophrenic Patients*

We come now to our second problem—that of comparing the scores of our own schizophrenic patients with those of the schizophrenic and other patients reported by Eysenck, though the main comparisons will, of course, be between the schizophrenic groups. The scores are given in Table VI.

First of all, however, we should point out that the five groups concerned in the Table have not been equated on sex, age, and intelligence, which would seem to be an important requirement before these comparisons are made. Fortunately, however, as Eysenck points out, correlations of most of these tests with age, sex, and I.Q., are known from previous work to be small or non-existent. The main comparison between the two schizophrenic groups in this Table is facilitated by equality in the ages of these two groups (present study—mean age—29 years; Eysenck's study—mean age—28 years) and approximate equality in I.Q. (present study—mean I.Q. = 94; Eysenck's study —mean I.Q. = "slightly below average"). There remains a sex difference (present study—all female; Eysenck's study 50 per cent. male, 50 per cent. female). It is not considered, for the above reason, that this difference will appreciably affect the results.

On the psychoticism battery, our patients are more psychotic on the tests of drawing circles and squares, on waves, and on tapping, whereas they are less psychotic on the tests of distance measurement, writing "year", and drawing a half-crown. Only one of these differences is statistically significant, which would suggest that the two groups are not differentiated in respect of this dimension.

With regard to the other tests in the battery, our patients show significantly less persistence, and probably more static ataxia. Although these findings are too few to enable a definitive conclusion to be drawn, they are at least suggestive that the two groups of schizophrenics occupy different dimensional positions, but not with regard to psychoticism.

Table VI also brings out quite clearly that there are very marked differences between Eysenck's two "normal" groups on the majority of these tests and we must, therefore, be extremely careful in dealing with the difficult problem of selecting normal controls.

In conclusion of this section of our discussion, the evidence does not suggest that schizophrenic patients who find themselves in mental hospitals are any more psychotic than those in the teaching hospital, though they may occupy different positions on the other dimensions.

(iii) *Changes after Treatment*

The relevant data are given in Table VII. The Mill Hill, Progressive Matrices and Nufferno Level tests of cognitive ability all show statistically significant improvements after treatment. On the Nufferno Speed tests, the improvements do not reach statistical significance.

Four of the five tests of neuroticism show statistically acceptable changes in the direction of less neuroticism. The fifth is not significant.

None of the Introversion-Extraversion tests shows a significant change after treatment, nor do any of the Psychoticism tests. It appears therefore that our patients as a group have changed in the direction of becoming more intelligent and less neurotic than they were before treatment.

(iv) *The Prognostic Value of the Tests*

It can be seen from Table VIII that if we compare the pre-treatment scores of a group of "recovered" patients with the scores of a group of patients who have required further treatment, or who have relapsed after discharge, the following difference emerges. On the test of Leg Persistence, those patients who were placed in the "fail" group were found to have had inferior scores on admission. This difference is almost significant at the 5 per cent. level on the two-tailed test. Conversely, those patients who had "recovered" had a high score on Leg Persistence on admission to hospital. On these data if we use a cut-off point of 40 seconds, we find that only six patients out of the twenty-four are mis-classified. This finding would, of course, require independent confirmation before it was regarded as established. If persistence is usually part of a "good personality", this finding is in keeping with clinical evidence for a good prognosis.

With regard to the psychoticism battery alone, the "recovered" group were more psychotic on admission on the tests of writing "year", three squares and waves. The "failed" group were more psychotic on admission on the tests of distance measurement, circles, tapping, and drawing a half-crown. There would therefore appear to be no relationship between psychoticism and prognosis.

With regard to the Neuroticism battery alone, the "failed" group had higher scores before treatment on all five measures of neuroticism. This is suggestive that response to physical treatment is better the higher the degree of neuroticism. It is not possible to test this finding statistically as the tests are not independent.

There is no apparent relationship between introversion or intelligence and prognosis.

CONCLUSIONS

We may conclude that our study provides no evidence for the existence of the personality dimensions, though these conclusions are by no means definitive. In this connection we should bear in mind that we have utilized schizophrenic patients only. We are further restricted by our choice of tests for the various personality dimensions, and our choice had to fall upon those tests requiring simple apparatus. What our results would have been if we had been in possession of such items of equipment as a conditioning laboratory, psychogalvanometers, pursuitmeters, and high fidelity tape recorders, it is difficult to say, but the need for such a study would appear to have been demonstrated.

Our data provide no evidence that acute schizophrenic patients occupy a different position on the so-called psychoticism dimension from the schizophrenic patients at the teaching hospital. There is slight evidence pointing towards differences on the other dimensions of neuroticism and introversion-extraversion, and marked differences between the two normal groups have been noted.

With regard to the changes following treatment, our patients changed in the direction of having more intelligence (or being able to apply themselves better to the tests) though their speed was not affected significantly. They scored significantly less on the tests of Neuroticism, but showed no significant changes in respect of Introversion and Psychoticism.

Finally, from the point of view of response to physical treatment, the Leg Persistence test shows the smallest amount of misclassification between the groups of successfully and unsuccessfully treated patients. Using a cut-off point of 40 seconds, only six out of twenty-four patients were mis-classified in this respect. This finding would require further corroboration before being considered for practical application. There appears to be no relationship between degree of psychoticism before treatment and prognosis, between intelligence and prognosis, or between introversion and prognosis, although a good prognosis does seem to be related to degree of neuroticism.

SUMMARY

The analysis of the test scores of thirty-five schizophrenic patients provides no evidence for the independent existence of the personality dimensions isolated by Eysenck. The psychoticism scores of these patients appears to bear no relationship either to the clinical state or to prognosis, the main change following treatment being a decrease in the neuroticism measures.

ACKNOWLEDGMENTS

We would like to express our thanks to the doctors and nurses on the wards, whose co-operative attitudes did much to reduce the labour in this study. We are also grateful to Dr. Charlton who has given us permission to publish these data.

REFERENCES

1. BAKER, A. A., GAME, J. A., THORPE, J. G., "Physical treatment for schizophrenia", *J. Ment. Sci.*, 1958, **104.**
2. EYSENCK, H. J., *Dimensions of Personality*, 1947. London: Routledge and Kegan Paul.
3. *Idem*, *The Scientific Study of Personality*, 1952. London: Routledge and Kegan Paul.
4. *Idem*, "Cyclothymia and schizophrenia as a dimension of personality", *J. Pers.*, 1952, **20,** 345.
5. KEEHN, J. D., "An investigation into the value of 'Objective Test Psychoticism' in predicting response to insulin coma therapy", *J. Ment. Sci.*, 1955, **101,** 871.
6. PETRIE, A., *Personality and the Frontal Lobes*, 1952. London: Routledge and Kegan Paul.

HYSTERIA—A RE-EVALUATION*

By

W. MALCOLM MILLAR, M.D., D.Psych.
Crombie-Ross Professor of Mental Health
University of Aberdeen

IT is interesting to reflect that it is 70 years since Charcot delivered his lectures on Hysteria at the Salpêtriére, 60 years since Freud and Breuer published their *Studies in Hysteria* and 50 years almost to the day that Pierre Janet was invited to lecture on the same subject at Harvard University. In that period—from Charcot to Janet—almost everything was said that could be said of this disease. So much so that we have entered into a sort of post-Galenic period in which all subsequent authors repeat—more briefly and less accurately—all that was said with such brilliance by this eminent triumvirate. What may be said that is new, really fresh? What researches of importance have been carried out in recent years that must today be reported, what up-to-date views on aetiology and treatment? It is humbling to admit that there are precious few. True there have been many contributions to other branches of psychiatry but it seems to me that the situation of the hysterical patient today is very much as it was when his grandparents and great-grandparents submitted themselves to the awesome scrutiny of a full neuro-psychiatric investigation.

I am conscious that descriptions of this state have been given for over 2,000 years, that Plato essayed an aetiological explanation, that Ambroise Paré, Fernel, Sydenham and other giants of the past concerned themselves with its various manifestations, making little more sense of it all than their predecessors. Furthermore, having acquainted myself with recent and current literature on the subject, I find that much confusion abounds: confusion that must in turn be communicated widely among students, physicians and young psychiatrists alike.

This confusion remains despite a number of notable advances that might well have had the effect of simplifying the problem. I will name a few of these advances:

(i) *Advances in Brain Physiology*

Studies on consciousness, cerebral integration, localization and differentiation of function with special reference to the visceral brain and the reticular activating systems (MacLean, Magoun, etc.).

(ii) *Advances in Brain Pathology*

The work of Penfield on temporal lobe epilepsy, followed up by Smith, who has reviewed 600 cases at least half of whom had shown functional symptoms that could have been diagnosed in the past as hysteria. All the information coming from studies of brain-injured and leucotomized patients indicating psychological and physical sequelae. Further knowledge regarding the correlation between hysteria and various organic diseases such as disseminated sclerosis and encephalitis. The discovery of new metabolic and endocrine syndromes such as spontaneous hypoglycaemia and phaeochromocytoma, the symptoms of which are often taken to be hysterical in the early stages.

---

* A lecture given as part of an R.M.P.A. Maudsley Bequest lecture course, Nov. 1956.

(iii) *Advances in Psychology*

Particularly those concerned with learning theory (Hull, Guthrie, Mowrer, Dollard and Miller), and those by Eysenck and his co-workers in this country. There is also the brilliant work of Jean Piaget, much neglected by psychiatrists, which will surely have applications to abnormal processes in so far as they describe so comprehensively the development of mental processes in the child. There is greater understanding of the nature of suggestion, and of course, from psychoanalysis, an immense hinterland of data behind the simple term, coined by Janet, "the fixed idea". Indeed, one might truly say that the whole of psychoanalytic theory is ranged behind the hysteric.

(iv) *Clinical Studies*

These have not been without their value. For instance the follow-up and re-examination by Reichard of the five patients described by Freud and Breuer in their original paper, in which it was found that two were in fact schizophrenics.

Despite all this we are still told in modern textbooks and monographs much that should have been discarded many years ago. One may even yet discern the Inquisitorial scorn of many writers when describing hysteria in terms similar to those which, in the days of the Malleus, would have immediately led to a burning at the stake! There are the witch-like qualities of personality, the cunning self-interest, the feignings and deceptions, the despicable weirdness of such symptoms as somnambulisms and fits and trances, the inexcusable dramatization and the diabolical tyrannizing by the hysteric of her relatives and friends, and so forth. Always there is the implication that the hysteric does this on purpose (Curran and Partridge), perhaps to avoid some unpleasantness (Harrowes), to create an effect and gain attention (Dicks), or simply to stir up trouble for everyone including the unfortunate doctor whose doubtful privilege it is to treat her—trouble that at times can be put down to plain malingering (Mayer-Gross, Slater and Roth). Some writers have explained hysteria on the basis of a single process. Gordon, for instance, regarded all hysterical phenomena as due to suggestion, as Charcot and Babinski had done before, but taking no account of Janet's detailed criticisms of this viewpoint. More recently Cobb has put forward the view that the basic process is that of "Playing 'possum'" as other mammals do in conditions of danger. Janet's own words are here relevant—"It will be later a matter of astonishment that physicians should have attributed to the caprice of the subject all the psychological and physiological laws that will be discerned in these various 'accidents'." Janet goes on to urge a much more precise definition of hysteria and the essential processes of hysteria. He saw a *peculiarily direct* connection between the hysterical idea and somatic function, a suggestion of a more primitive process than the normal relation between idea and function. He went on to elaborate his views on restriction of the field of consciousness and the presence of dissociation as explanatory concepts. "*It is a malady of personal synthesis*", he says, and in this respect he is in accord with Freud's earlier writings in which he gave prominence to dissociation and the hypnoid state. Here is Janet's own definition. "*Hysteria is a form of mental depression* *characterized by a retraction of the field of consciousness and a tendency to the dissociation and emancipation of the systems of ideas and functions that constitute personality*".

It would be interesting to speculate on what changes Janet himself would make if he were as familiar with modern trends as we are. He would no doubt be fascinated with psychoanalytic efforts to answer one question he repeatedly asked: "What is the reason for the particular symptom, the specific localization?" Although he himself was well aware of Freud's views on repression and the effect of psychic traumata, which he was inclined to repudiate, he might well by now have been won over by the mass of clinical evidence to support Freud's views. He would have been delighted with the discoveries of the learning theorists who have shown that "reactive inhibition" of the cerebral cortex is a fact and that it may well correspond to his "form of mental depression restricting the field of consciousness". Eysenck's recent studies of hysterics, in which he claims a significant correlation between this tendency to "reactive inhibition", extraversion and hysteria would have given him great satisfaction. He would have been influenced by some of Penfield's findings, and those of his countryman Gastaut, concerning the presence of hysterical symptoms in the epilepsies, and this would confirm him in the view that the condition of hysteria was a disorder of the central nervous system, no doubt to be formally distinguished from the epilepsies, but closely related to them.

I very much doubt if he would find anything of interest in a current textbook. Indeed he might be amused to see that the fashion among medical men to find yet another definition of hysteria continues. He would poke fun now as he did then "Though Lasègue said that hysteria should never be defined . . . since that declaration everybody has tried to define it." But he goes on more charitably, "But . . . do not forget that we are speaking of medicine, and that this is rather a special domain, less calm and serene than high mathematics. You should not ask too much of the virtue of the physician, or hope that he will confine himself to repeating the definition of a predecessor, even if he does not cite his name. What would be left for him?"

Thus, with some encouragement from Janet and the other immortals I feel I may express my own views on this topic. You will readily observe that they are not in any way original, but rather an up-to-date review of established findings. My principal aim is to simplify these findings in such a way as to bring a little more order into this very confused topic. It is, if you like, a "narrowing of the field of hysteria".

The Conditions for a Satisfactory Definition of Hysteria

If we are to have a clear and simple notion of hysteria, certain conditions must be fulfilled:

(*i*) The data to be described must conform to accepted scientific standards of reliable and consistent observation and to accurate, agreed definition. The various paralyses, dysfunctions, fugues, fits, anaesthesias and so forth must be accorded exact significance.

(*ii*) The definition must be sufficiently distinctive to exclude similar conditions known to be caused by organic disease and other factors. We must not talk of hystero-epilepsy, nor of "hysterical overlay" of a cerebral organic disorder such as encephalitis, disseminated sclerosis and cerebral tumour, although these may later come to throw some light on the hysterical process.

(*iii*) We must accept the general finding that the *onset* of hysteria is *rapid*, and invariably related in time to some *impressive event*. This impressive event may be of almost any character: Here are some examples from Freud—A girl watching "with harrowing anxiety" at the bedside of a sick person when her arm goes to sleep. A man assisting at the reduction of his brother's ankylosed hip. Dora's seduction by Herr K.; a clerk assaulted by his boss. Then there are the war neuroses and the traumatic neuroses linked to definite events of a threatening character. The list could be multiplied indefinitely. It is, however, not always clear whether an impressive event is, of itself, sufficient to precipitate an attack. Psychoanalytical theory now requires some *prior event*—a psychic trauma—occurring at the time of the Oedipus complex and repressed. But for simplicity we may then take this *prior event* as fulfilling the requirements for an *impressive event*.

(*iv*) Almost all writers describe a particular *state of mind* as a necessary condition at the time of breakdown. This is variously described as a hypnoid state (Freud) and as restriction in the field of consciousness (Janet) and of exaggerated suggestibility (Babinski, Charcot, Gordon). "In an atmosphere of emotion or in one of bodily discomfort" (Purves Stewart quoted by Barbour).

(*v*) In one form or another *Dissociation* is observed by all: a splitting-off, conversion, displacement, belle indifférence and, from a different viewpoint, repression, all contain this same factor. To quote Henderson and Gillespie: "An independence of function as well as isolation of it from other functions . . . The dissociation of the ideational content while affect remains."

(*vi*) There must be some account of the essential immaturity of the hysteric, physical and emotional; an excessive demand for security. This feature is held to be constitutional in nature, though some might argue that it arises during the early months and years of life under conditions of rejection and other forms of insecurity. This latter view would equate the hysterical illness with the hysterical personality, and this point must be examined more closely later.

(*vii*) The definition must take account of medically induced artefacts.
(*a*) Direct and indirect suggestions by doctor.
(*b*) Surgical and medical treatment distorting the process.
(*c*) "Observer error" (counter-transference) in the doctor.

These artefacts abound in the medical literature on this subject, and creep into countless case records that may later be employed in researches into this condition.

(*viii*) In so far as the condition affects bodily functioning it must follow that hysteria is a disorder of the central nervous system. There remain some who still hold to peripheral theory—that the particular organ itself is affected. This is a relic of the theory of the wandering womb first put forward lightheartedly by Plato. Likewise there are some who hold to an exclusively psychological theory. But this too is nonsensical, for we are manifestly concerned with the physical and the tangible.

Keeping these points in mind we must now attempt a definition. Hysteria is a condition of the central nervous system characterized by a particular form of immaturity whereby the integrating functions are impaired. It is a constitutionally determined *un-integration* (rather than a dissociation) of the several autonomous systems normally operating in the central nervous system.

I must make clear what I mean by this definition and in particular what I mean by integration. Recent studies of the structure and function of the C.N.S. suggest the need for a revision of the classical views of Hughlings Jackson and his innumerable followers. Jackson's view was that the organization of the C.N.S. followed a roughly phylogenetic principle: the evolutionally earlier and simpler structures come under the control of the later, more complex structures; with the cerebral cortex, the most complex and last of all responsible for the so-called "higher" functions. It now seems likely that there is no such rigid hierarchy, but that there is a number of more or less independent systems, composed of both early and recent structures, and that there are, for instance in the rhinencephalon, old structures that have continued to develop in the course of evolution every bit as much as the cerebral cortex. In other words, vestigial structures have acquired new functions. A particular example of this is the hippocampus, which in primates appears to be less associated with the differentiation of olfactory stimuli than with the elaboration of emotional feeling. The exact function of these various systems cannot as yet be defined, but enough is known to assign to them roles for which at one time we thought only the cerebral cortex was responsible. However, these systems are interdependent, the one on the other, and are subject to established laws relating to neuronal development and organization. Recent research on the reticular formation, for example, has begun to classify this notion of interdependence. It therefore does not seem necessary to think of mental processes as strictly hierarchical. In some respects anarchy reigns—or at any rate a crude democracy. The capacity for integration and organization resides, not in the cerebral cortex alone, but throughout the whole central nervous system. This organizational capacity is perhaps closely related, in the mental sphere, with what we call the ego. We must therefore imagine, not a Jacksonian pyramid, but a matrix or lattice. Indeed we could not at this stage do much better than take for our model the actual physical characteristics of the human brain and nervous system. This has been done with great brilliance by Hebb. Cybernetics has also contributed its share to this revision.

Figure 1 is a diagrammatic representation of personality structure based upon this modified scheme of organization. There is no departure from any previously established principle except that of simple hierarchy. The systems are drawn in clusters in white, grey and black. The black have become integrated by reason of their connections with other systems. Some of these are small, not yet clustered; others have acquired considerable cohesion with contiguous systems and as they cohere they enlarge. The white represent unintegrated systems having no external connections. The grey represent systems of intermediate degrees of integration. This diagram might represent either an immature or an abnormal (hysterical) personality structure because of the presence of unintegrated systems. The mature, fully developed personality would be expected to have achieved a more extensive and efficient organization than this. "Ego strength" would perhaps be determined partly by the degree of integration and partly by the degree of awareness (insight) of the nature and limitations of the integrated systems.

Now the principle of generalization is not particularly affected by this new scheme. It merely suggests that generalization is more a matter of "horizontal" spread than of vertical, i.e. to ever higher degrees of abstraction and ever more

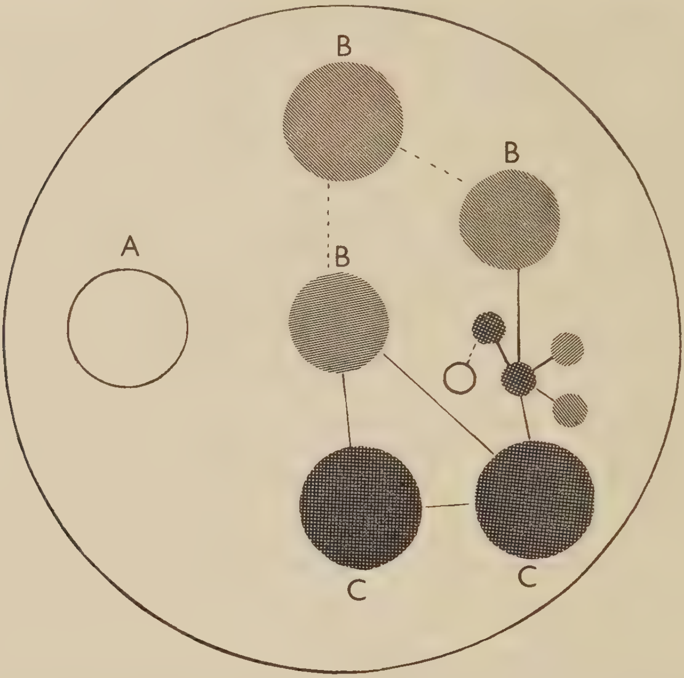


FIG. 1.—Diagrammatic representation of hysterical personality structure.
Note: A. Ego system unintegrated with other systems.
B. Ego systems partially integrated with other systems.
C. Ego systems fully integrated with other systems.
Ego boundary indicated by surrounding circle.

general sets of principles *for the whole C.N.S.* (There is considerable agreement here with Eysenck's "six points" regarding personality organization, although he has not himself abandoned the traditional usage of the term "hierarchical").

We must particularly bear in mind that every "system" being autonomous must possess its affector, central and effector components. (I personally incline to the view that in some (for instance the reticular formation) the central component is the most important and may well be responsible for spontaneous, creative experience, irrupting into the outside world with no previous history either in that world or in the inner world of personal experience. But this is a digression.)

We now have, I submit, a simple and understandable basis for the hysterical state. The basis is un-integration of autonomous systems. These systems possess an arbitrary character and may give trouble or distress at any time. However, since we know that in some manner hysteria is related to "impressive events", we must assume that these events have a specifically evocative character for some particular independent sub-system (not related to the main personality). This evocation will be expected to produce symptoms relevant to the system, and to some extent relevant to the event. This is therefore not dissociation but un-integration. How much this corresponds to Janet's "emancipation of the systems of ideas" you may judge for yourselves, but to me it is a striking tribute to his clinical acuity.

I have often wondered, when a patient under psychotherapy recalls some past traumatic event, whether the unique factor in the whole complex was not the particular manner in which the patient handled the experience. This point has of course been made repeatedly since Freud described the hypnoid state. But somehow later writers, including Freud himself who abandoned the notion of hypnoid state for the more dynamic one of repression, have focused their attention on this uniqueness in terms of past experience, rather than upon an enduring characteristic of the individual nervous system. I think we might profit again by a re-examination of the hypnoid state and ask whether it may not *always have been present*, i.e. that it was an enduring feature of the personality structure. One reason why this old and rather static idea may have been abandoned was that under the influence of the Jacksonian hierarchy, it could not be imagined that *at one and the same time* an hysterical personality could exhibit purposeful, integrated behaviour *and* unintegrated (dissociated) behaviour. If only one unitary system were operating then hysterical behaviour could only be accounted for by some such notion as "dissociation" or "repression". Now we see that it is altogether possible for the hysterical person to display incongruities of behaviour and thinking without the need for these notions. (This, of course is not to suggest that repression does not exist, but rather that it does not seem to occupy so central a position in the psychopathology of hysteria as had been formerly attributed to it.)

It is known, for instance, that sensory information can be picked up and stored without the subject being consciously aware of it—as many psychological experiments have shown.

We have then a truly "split mind", in the hysteric, a situation for long appreciated by most psychotherapists. (Fairbairn in particular, has stressed this process in the language of object relations.) However, it should again be stressed that we are here dealing with a split mind that has always been split, and not with one that has come to be split under the stresses of early life. Loewald comes nearer to this view in his reappraisal of Freud's account of the hypnoid state. He puts forward the view that "traumatic events" in early life are merely laid down as unconscious memory traces, i.e. that they do not establish associative connections. Repression perpetuates this "non-arrival in consciousness", which in the hysteric is due to the immature state of the ego. He elaborates this more fully in keeping with the classical view of the repetition compulsion but this seems to me to be unnecessarily cumbersome as an explanation, when we may more simply explain the "non-arrival in consciousness as 'un-integration'". An amusing example of this unintegrated state is told by Siegman, when discussing "Emotionality as a Character Defence". "A new widower disappears on the occasion of his wife's funeral. He is finally found, to the horror of everyone, having intercourse with the maid. To their cry, 'What are you doing?' he responds, 'How do I know? I'm out of my mind with grief'."

We come now to a brief discussion of the term "Impressive event". I use "*event*" as Whitehead has defined it. Space and time do not permit me to give an extensive definition. "Impressive" is employed in a somewhat neutral sense, i.e. any event that is transmitted from the external world by whatever route. It need not be a painful event, nor one that carries with it the implication of conflict. Any relatively novel circumstance in the life of the individual is an "impressive event". The point to note is that it arrived "out of the blue" and is not recognized in terms of past experience. It may contain many of the elements of familiarity, e.g. the appearance of a parent, but there are novel elements that transform the whole event, e.g. the inclusion in the parental event of explosive temper or an exposed genital. In the normal person there will be an attempt to recognize, to evaluate, discriminate, criticize and then to accept, modify or reject such an event. The wealth of associations from other systems is mobilized and the individual comes to terms with the event. In the hysteric on the other hand, there is a failure of recognition, an absence of criticism, a limited incorporation of the event, almost unchanged, with little or no associative reverberations with other systems. The event has been impressive but it has no significance. At least it has no significance in relation to the rest of the personality, though it may occupy an important—at times disrupting—position within it. Later editions of similar events transmitted to the individual may reinforce or modify the process which takes in the character of arbitrariness. Thus we may find any and every kind of symptom occurring, relevant to the particular system involved with the impressive event. The variety is further ensured by the phenomenon of identification and mimicry commonly found in this condition. It will be apparent why, in accordance with this thesis, identifications are so readily established in this condition. There would seem at all times to be a readiness on the part of one system or another to become impressed with a novelty, impressed in an uncritical unintegrated manner.

It follows that the more elaborate consequences of a highly organized individual experience do not occur in the hysteric. Events retain something of their pristine and primitive character. A scolding mother will remain the provider of bad and poisoned milk. A threatening father will retain much of his crudely biological character. Reactions to these events will likewise persist on a more infantile level. It is not that the hysteric has learned more "control" over his visceral functions than the normal (as a fakir might) but that he has never learned anything else. He persists in operating at a non-verbal level. The immature hysteric does not perceive events as does the mature person—as events overlaid in their immediacy by the reverberations of past organized experiences, modifying the present and in turn being modified by it. He perceives events as isolated experiences.

We see then, that the hysteric can with great facility manifest almost any symptom that could be produced by the activation of any of the systems of the C.N.S. And we have seen that descriptions and definitions of hysteria have varied over the years for this reason, like a Sears, Roebuck Catalogue, requiring a mammoth new edition each year. We have noted the various mechanisms associated with hysteria: identification, dissociation, displacement, conversion, dramatization. We see also that they overlap or are more or less synonymous. Each may be re-evaluated in the light of the present thesis. Dissociation we have already discussed at length. Conversion we may now see as immature, somatized activity that has not yet reached a more symbolic level of organization: it is asymbolic rather than dissymbolic. Displacement is likewise immature somatization. Identification may be understood as I have already indicated: as an impression of events upon an over receptive, uncritical limited system. Dramatization is also to be regarded as a part reaction by a limited system, usually on the basis of identification. A professional actor would take serious exception to the dramatic performance of the hysteric. He might describe it as "hamming" of the worst order. (In this connection, however, we should also consider the role played by the mechanism of "spectating" in the dramatic performance of the hysteric. If we assume the existence of several autonomous systems and not one hierarchical system then there is room for this notion of "spectating" of some systems upon others. This is a common finding in psychotherapy.)

What of treatment? It follows from what has gone before that therapy in the hysteric is essentially synthetic and educative. Insight therapy with or without abreactive procedures is unsound. It is interesting to note that psychoanalytic views are exactly in keeping in that they stress the need for the "working through" of unconscious conflicts in the hysteric. If we assume that Eysenck is right, and that one important factor in this immaturity of the hysteric is "reactive inhibition" this will explain why it is that sedative and tranquillizing therapies are ineffective or even harmful. Social therapy, carefully planned to meet the special needs of the hysteric, should be more fully developed. There is a fundamental contrast here between the obsessional process and the hysteric. For this reason it is mistaken to apply similar methods of treatment. This tendency to blanket our neurotic patients with uniform treatment procedures must result in a paradox: some will improve, some will remain unchanged and some may actually deteriorate. Among those that improve there will be some making a spontaneous recovery. There is a need, therefore, for a more rational approach to therapy in general and this examination of the essential nature of hysteria represents, in a very limited way, the kind of approach I think we should make.

Hysteria will always fascinate some and annoy others. It might be interesting to speculate on this: for instance do the extraverts or the introverts bristle more when faced with a "gross hysteric". One could think of many points of debate on their side but we will not pursue the matter here.

Let me end with a fanciful description of the hysteric:

The hysteric is a young woman who believes:

That God is a daemon
That her father is God
That her husband is her father
And that her son is her husband.

REFERENCES

BARBOUR, R. F., "Hysteria" in *Modern Practice in Psychological Medicine* (Rees, J. R., Ed.), 1949. London: Butterworth. p. 187.

CHARCOT, J. M., *Diseases of the Nervous System*, 1889. London: New Sydenham Society.

COBB, S., *Foundations of Neuropsychiatry*, 1948. New York: Williams & Wilkins.

CURRAN, D., and PARTRIDGE, M., *Psychological Medicine*, 1955. Edinburgh, Livingstone.

DICKS, H. V., *Clinical Studies in Psychopathology*, 1939. London: Arnold.

FENICHEL, O., *Psychoanalytic Theory of Neurosis*, 1946. London: Kegan Paul.

GORDON, R. G., *The Neurotic Personality*, 1927. London: Kegan Paul.

HARROWES, W., *Human Personality and its Minor Disorders*, 1949. Edinburgh: Livingstone. p. 234.

JANET, J., *Major Symptoms of Hysteria*, 1907. London: Macmillan.

MALAMUD, W., "Psychoneuroses", in *Personality and Behaviour Disorders* (Hunt, Ronald, Ed.). Vol. II. 1944. New York.

MAYER-GROSS, W., SLATER, ELIOT and ROTH, MARTIN, *Clinical Psychiatry*, 1954. London: Cassell.

PIAGET, J., *The Construction of Reality in the Child*, 1954. New York: Basic Books.

REICHARD, S., "Re-examination of *Studies in Hysteria*", *Psychoanal. Quart.*, 1956, **25**, No. 2, 155.

SIEGMAN, A. J., "Emotionability", A Character Defence, *ibid.*, 1954, **23**, No. 3, 339.

THE SEVENTIETH BIRTHDAY OF R. GJESSING*

By

H. FRÖSHAUG

and

N. B. JOHANNESSEN

Asker, Norway

(Translated by D. Richter)

GJESSING has taken a leading part in the clinical investigation of mental illness during the past twenty-five years. We believe it would be in accordance with his wishes that, in presenting a profile to mark the occasion of his seventieth birthday, we should choose to describe Gjessing's research interests and scientific achievements rather than his personal qualities.

Gjessing qualified in medicine in 1913, and during the first seven years of his medical career he worked as Regional Physician up in the arctic North of Norway. His psychiatric training started in the Kraepelinian era, and he was influenced mainly by Kraepelin, and later by Bonhoefer and Kurt Schneider in his psychiatric thinking. But his special knowledge of scientific methods he owed mainly to the geophysicist Bjerknes. It was from Bjerknes that he learned the value of carrying out a set of precise measurements daily over a long period of time and systematically analysing the results by plotting them in the form of curves. This was the approach that Gjessing applied so successfully in the clinical field.

Gjessing was first appointed at the Dikemark Hospital in 1923, and most of his scientific work was carried out in the laboratory that he established there. Throughout the whole period until 1949 when he retired from his post as Physician Superintendent, his scientific work was carried out under conditions of considerable difficulty. The days were more than fully occupied with his ordinary clinical and administrative duties as a medical officer of the Hospital, and it was only by working regularly at night that he was able to make time for research at all. As a clinician, Gjessing was characterized by his meticulous care and his attitude of kindly responsibility towards his patients. And we, who were his assistants, will never forget how every night when we went home the light was still showing in his laboratory. We knew that he was still working there, keen and lively as ever, and always ready to discuss our work or his own with us at any time.

The results of Gjessing's investigations appeared in the *Archiv für Psychiatrie* during the years 1932 to 1953, in the form of a series of communications entitled "Notes on the somatic aspects of periodic catatonia". The essential findings may be summarized briefly as follows: (*a*) Catatonic stupor and catatonic excitement are symptoms of a basically similar pathophysiological process; (*b*) Nitrogen retention plays a central part in both forms of illness; (*c*) In the lucid phases, when the patient is mentally accessible and practically normal, there is a reduced basal metabolic rate (BMR), an increased activity of the autonomic processes mediated by cholinergic nerve-endings and a positive nitrogen balance; (*d*) In the phases of mental abnormality, on the other hand, there is an increased BMR, increased adrenergic activity and a negative nitrogen balance; (*e*) There is thus an alternation between a nitrogen retention syndrome and a compensation syndrome. In the forms of catatonia that take a cyclic or periodic course, the changes in mental and physiological function are synchronous. Gjessing concluded from his findings that periodic catatonia is characterized by a pathological process that is in the nature of a chain reaction: the process is endogenous in origin and little influenced by exogenous factors of any kind. The clinical picture indicates that this process involves a periodic stimulation of the centres in the brain-stem, and the symptoms might be attributed to a "diencephalosis" of toxic origin.

---

* An address given at the International Congress for Psychiatry at Zurich, 1957.

In his publications of 1939 Gjessing suggested that the phases of mental excitement or stupor are manifested in some cases at the beginning and in some at the end of the period of negative nitrogen balance, though invariably at the same point in the nitrogen balance curve. He distinguishes between an A-type, where the so-called "stimulation phase" comes at the beginning, and a C-type, where it comes only after the negative nitrogen balance has persisted for some weeks. Later he showed that there were also patients of a B-type, where the "stimulation phase" comes shortly after the beginning of the period of negative nitrogen balance.

It is of special interest that Gjessing was able to show that the metabolic dysfunction causing the mental and physical symptoms could be corrected by means of thyroxin, and that the nitrogen retention could be prevented by treatment with thyroid. He regarded this as a means of compensating for a metabolic deficiency.

In his last publications of 1953 he describes control experiments with physically and mentally normal and healthy young men who were kept under exactly the same conditions as his patients. In comparison with the periodic catatonics, these control subjects showed remarkably little variation in the various physiological and metabolic functions that were studied in the patients, and factors such as physical exercise had little effect on the time curves.

Gjessing has also made a special study of the problem of how far external factors in the environment affect the clinical syndrome in periodic catatonia. As a result of his investigation of factors affecting the nutritional state he was able to devise an optimal standard diet that produced a considerable moderation in the severity of the symptoms and greater regularity in the alternation of the lucid and abnormal phases, when used over a period of several months. At the same time he showed that the body weight and nitrogen balance of his patients were not related to the degree of physical activity. In some of his patients it appeared that the time of onset of the phases of mental abnormality could be shifted a few days by sudden changes in the weather, such as barometric changes or changes from hot weather to cold. Occasionally the abnormal mental phases were also brought on earlier by psychic trauma occurring during the phase of autonomic lability shortly before their expected time of onset.

The clinical syndrome of periodic catatonia may be attributed primarily to a phasic variation in thyroid activity, with alternating periods of hypo- and hyperfunction. Thyroid deficiency appears to be a link in a vicious circle, which can be broken by administering thyroid. It is reasonable to believe that the thyroid dysfunction may influence the brain metabolism by affecting some enzymic reaction occurring in the neurones of the autonomic centres of the hypothalamus. Adrenocortical dysfunction does not appear to play an important role, but there is evidence of a defect in liver function since there is a phasic increase in the excretion of urobilin and bile pigments.

Among Gjessing's main achievements must be counted the new methodological approach which he introduced in the clinical study of the problems of psychiatry. His investigations depended on the central hypothesis that in the vast majority of cases seen in mental hospitals the psychoses are the result of a primary physical or metabolic disorder; and of this he became increasingly convinced. So far as the so-called schizophrenias are concerned, he takes the view that our understanding of their pathogenesis is still too limited for any definite conclusions to be drawn, and this is mainly due to the problem being approached from the wrong angle. The study of these conditions along purely psychopathological or psychodynamic lines is entirely inadequate. The development of the characteristic schizophrenic syndromes is determined by three main types of factors: (*a*) exogenous factors of a physical and mental kind, such as psychic trauma, stressors, chronic infections, etc., (*b*) factors inherent in the hereditary constitution and (*c*) in certain cases a specific endogenous process that is probably in the nature of an enzymic failure.

If the combined effects of these various factors exceed the maximal tolerance of the subject, a psychosis develops. It is not possible to say which of these factors is the most important, for only after careful investigations and analysis can this be determined in any particular case. The study of the mental symptoms and psychopathology of the patient tells us much about the reaction-type of the individual, but little about the nature of the disease. The selection of patients on the basis of their showing a similarity in mental symptoms gives no guarantee of a similarity in pathogenesis; and groups selected in this way are unsuitable for statistical treatment as homogeneous groups. It is necessary for each schizophrenic patient to be studied individually, as if he were suffering from a new and entirely unknown disease. Every possible exogenous factor, and especially chronic infections, should be eliminated. The patient must be put on a uniform standard diet, and the various bodily functions must then be studied by applying daily a battery of measurements and function tests. Only in this way will it gradually be possible to gain an insight into the pathogenesis of the condition in small numbers of carefully defined cases, so that the findings can be tested and confirmed by other investigators.

This approach to the investigation of schizophrenia is something that Gjessing has advocated all his life and defended on many occasions, so that he has exerted a profound influence on psychiatric thought. It could hardly be expected that his teachings would be universally popular, or that other investigators would be in any great hurry to adopt a method of investigation so exacting in its requirements and so demanding in patience and time. Quick or sensational results are unlikely to be forthcoming from metabolic studies and function tests carried out on individual patients with meticulous care and continued for periods of many months and even years. Nevertheless, Gjessing's work has influenced an increasing number of serious investigations, and his main results have now been confirmed and extended in many other laboratories throughout the world. Among the leading investigators who have adopted his methodological approach may be mentioned Danziger, Kindwall, Stokes, Greving and Mall.

Although characteristically modest in his personal relations, Gjessing is fiercely uncompromising in his insistence on the highest standards in his scientific work. It would be out of place to attempt to judge his achievements here, but we may quote the comment of the Editors of the *Archiv für Psychiatrie und Zeitschrift für Neurologie* who introduced his "Communication

V" in 1953 on periodic catatonia with the note "The following four papers are an extension of Gjessing's Communications I–IV which constitute one of the main foundations of our knowledge of the somatic investigation of the psychoses". The thing that matters most to Gjessing himself is to see his work carried forward, for in his own words "Only when we have a sufficient number of exact observations on individual cases will it be possible to write, instead of case histories, the story of the disease process itself."

AN INVESTIGATION INTO THE THERAPEUTIC ACTION OF HYDROXYZINE (ATARAX) IN THE TREATMENT OF NERVOUS DISORDERS AND THE CONTROL OF THE TOBACCO-HABIT

By

G. C. TURLE, M.D.(Lond.), D.P.M.
Assistant Psychiatrist
St. Augustine's Hospital, Chartham, Kent

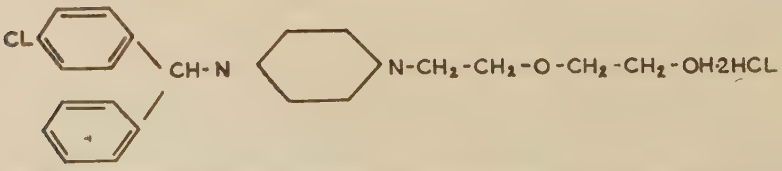
INTRODUCTION

HYDROXYZINE hydrochloride (Atarax, UCB 4492) is a tranquillizer which has attracted much interest in the United States, where it has undergone a series of clinical trials with encouraging results. In order to test the claims of American investigators a trial of hydroxyzine was made on a group of psychotic and psychoneurotic patients in a large mental hospital. The effectiveness of hydroxyzine in controlling the tobacco habit was also tested by using volunteer nurses at the hospital. Their observations provided useful information on the subjective action and side effects of the drug. A small number of young children attending a local child guidance clinic were also included in the clinical trial.

PHARMACOLOGY

Hydroxyzine is described as "a neuroleptic agent" (Delay and Farah), its predominant effect being the relief of nervousness, restlessness, and emotional tension. It is reputed to have no untoward effect on mental performance. Its sedative action differs from that of barbiturates, bromides or chloral hydrate whose quietening effect is the result of hypnosis. Narcolepsy and narcosis do not occur even in doses far in excess of the usual therapeutic range. Its pharmacological action is said to resemble that of chlorpromazine and Pacatal in producing neuro-sedation and muscular relaxation without altering consciousness. Its main value is said to lie in its tranquillizing effect in acute and chronic emotional disturbances of either psychogenic or organic origin.

Hydroxyzine is chemically related to the anti-histaminic group of drugs. It comprises a tertiary ethyl-amine linked to two symmetrical rings. Its special pharmacological properties result from the substantial modifications of its amine group. It has been suggested that hydroxyzine acts by depressing the reticular formation in the brain stem. The structural formula of hydroxyzine is given below:



1-P-Chlorobenzhydryl-4[2-(2-Hydroxyethoxy)-ethyl]-diethylene-diamine dihydrochloride

THE EXPERIMENT

GROUP I

Clinical Material

The material was selected from several sources. One major group comprised 81 patients drawn from the disturbed wards of the hospital. They were selected almost exclusively for the overactivity or aggressiveness that they exhibited. Most had presented a persistent and difficult nursing problem for a long period. Of this group there were 55 females and 26 males whose ages ranged from 22 to 81. The largest number (43) was made up of schizophrenics with a preponderance of paranoid types. The other selected patients included 15 agitated seniles, 7 aggressive epileptics, 5 cases suffering from mania and 6 from depressive states. A miscellaneous group made up of agitated patients included one patient suffering from Huntington's chorea, one hysteric, one mental defective and two patients suffering from pre-senile dementia.

Clinical Assessment

All patients were observed in their own wards and each was assigned an individual chart on which were recorded daily the number of verbal or physical outbursts. Regular entries were made by either the day or night staff as incidents happened. The nurse in charge in each ward was asked to write a daily report on the behaviour and progress of each patient (and day to day observations were thus obtained). It proved to be a most reliable guide in assessing the patients' response to the experiment and gave a 24-hour record of each patient throughout the trial. Particular emphasis was laid on recording the degree of overactivity, noisiness or submissiveness of each patient as well as of their sociability or withdrawal. Alterations in eating or sleeping habits were also recorded. Undesirable side effects from the drug were also recorded in detail. Each patient was personally interviewed by the same medical observer once a week throughout the trial period. The normal ward routine to which the patients were accustomed was carefully preserved. Routine blood counts and blood pressure recordings were made at weekly intervals.

Administration and Dosage

After a preliminary control period of one week when all sedatives and other tranquillizing drugs were withdrawn, hydroxyzine tablets or placebo tablets, the latter indistinguishable from the former, started to be administered. Each patient received placebo and active preparation alternately and for definite periods, i.e., within the duration of the experiment each patient received the active preparation for a total of 5 weeks with random interspaced periods of 3 weeks during which the inert control preparation was given instead. Both the active and inert preparations were administered in the form of 3 tablets t.d.s. The routine dosage of active tablets was 90 mg. daily. The experiment lasted 8 weeks (during which time each patient was used as his own control). Only the hospital dispenser knew the identity of the active or inert preparations at any given time throughout the trial. After the conclusion of the main experiment on this group a small batch of 12 patients was maintained on a higher dosage of active tablets (270 mg. daily) for a longer period.

Results

The results are summarized in Table I. It was noticed that during the initial stage of the experiment, i.e., during the first two weeks, a number of patients seemed to improve regardless of whether they were having the active or inert preparation. An unavoidable alteration in their environmental conditions brought about by the very nature of the experiment was thought to be mainly responsible, and it was considered that the patients were responding to the increased attention that their close and continued observation necessitated. This phenomenon has been observed by other workers with controlled experiments (Elkes *et al.*, 1954; Mitchell, 1956).

TABLE I

		Schizo-phrenics		Senile Psychotics		Epileptics		Manics		De-pressives		Mis-cellaneous	
		M	F	M	F	M	F	M	F	M	F	M	F
Improved	31	7	12	—	7	–	–	2	2	1	–	–	–
Unchanged	43	11	11	–	6	–	4	–	1	–	5	1	4
Worse	7	2	—	–	2	2	1	–	–	–	–	–	–
Total	81	43		15		7		5		6		5	

In assessing results, cases were classified into three categories. In cases labelled "improved", the clinical amelioration was found to be conclusively attributable to the drug. There was a definite improvement in the social behaviour of a number of schizophrenics who became quieter and more responsive. Noisy or aggressive outbursts were greatly diminished. One chronic schizophrenic ceased to be destructive and degraded in habits. Four patients suffering from maniacal overactivity showed considerable reduction of excitability, their lessened psychomotor activity being particularly noticeable. With the switch over to inert medication there was a conspicuous relapse in their symptoms within a week. The restless and purposeless activity of the senile psychotic was successfully controlled in the majority of milder cases, but without effect in the more severe cases. Two cases who had been well controlled by paraldehyde became unmanageable when given hydroxyzine. It should be noted that only one depressive showed signs of improvement—this patient, who suffered from agitated melancholia, was found to be less tense and restless but there was no manifest amelioration in his affective mood. In none of the cases who were found improved was the amelioration more than symptomatic, the structure of their illness remained unchanged and none were sufficiently improved to be discharged from hospital.

The cases described as "unchanged" did not show any significant alteration in their behaviour or symptoms. If any transient improvement took place it could not be ascribed to the effects of the active preparation. This was the case in over half the number of chronic schizophrenics, who seemed totally unaffected, even when a small proportion of them (12 cases) were given a much higher dosage of hydroxyzine (270 mg. daily) after the conclusion of the main experiment. Epileptics and depressive psychotics seemed also in the majority unaffected by the drug. A relatively high proportion of aggressive and excitable epileptics became unmanageable and had to be withdrawn from the experiment because of their violence. In no case was the anti-convulsant medication discontinued during the period of the experiment. Two chronic schizophrenics became markedly more agitated under the influence of hallucinations and showed an accompanying tendency for assaultive or destructive behaviour.

Few side effects were noticed; the one most usually observed by the nursing staff was drowsiness, in approximately 10 per cent. of cases. It was never severe enough to interfere with the patients' daily activity. A very small number of patients complained of increased intestinal peristalsis and dryness of the mouth. There was no significant lowering of the systolic or diastolic blood pressure in any of the patients during active medication with hydroxyzine. Blood counts showed no variance from the normal.

Group II

This second group comprised 18 patients admitted to the neurosis unit of the hospital. They were selected because they exhibited anxiety symptoms in a clearly recognizable form and were found capable of formulating their subjective experiences adequately with the aid of a questionnaire. The group included 7 anxiety neuroses, 1 obsessive-compulsive state, 6 depressive states and 1 involutional melancholia. The method of administration of the drug and the clinical assessment of results approximated to those used in Group I, the only significant difference being the shorter duration of the trial, which lasted only 4 weeks. Each patient received placebo preparation first for two weeks and then the active preparation 30 mg. t.d.s. for another two weeks. At the end of each placebo and hydroxyzine run they were given a questionnaire in which they were asked to state whether they found the drug beneficial and in what respects their symptoms had been alleviated. Therapeutic interviews were carried out in a routine fashion as with the other patients in the ward.

The results are summarized in Table II and are compiled from both objective and subjective sources, the final assessment being made on the combined observations of medical staff and patients.

Table II

Diagnostic Classification	No.	Improved		Not Improved	
		Male	Female	Male	Female
Anxiety states	7	–	1	3	3
Obsessive compulsive ..	1	–	–	–	1
Depressive states	6	–	1	1	4
Involutional melancholia ..	4	–	1	–	3
Total	18	3		15	

It can be seen that only 3 cases showed signs of improvement. One patient suffering from tension symptoms was much improved and her accessibility to psychotherapy thus enhanced. A recurrent depressive who exhibited severe obsessional symptoms was considerably relieved. The third patient, an involutional melancholic who had failed to respond to electro-convulsive therapy, was significantly improved by the active preparation. The remaining patients were totally unaffected by the drug. Five patients showed drowsiness and one complained of headache and dryness of the mouth whilst receiving the active preparation.

Group III

From the list of cases currently referred to a local child guidance clinic eight children were specially selected because they exhibited anxiety symptoms associated with behaviour disorder. Their ages varied from 8 to 13 years. Five had refused to attend school and attempts to coerce them back into school had regularly precipitated serious temper tantrums, hysterical outbursts or frank panic reactions. Three of them suffered from nausea and vomiting in the morning. All had developed fearful phantasies about their school. A change of school in two cases had failed to induce them to attend regularly. The remaining three cases were seriously maladjusted children whose overactive behaviour associated with distractibility and tension made them difficult to manage both at home and at school. Two were enuretic, one being also encopretic.

They were each placed on hydroxyzine (10 mg. t.d.s.) for periods varying from three to six weeks. The inactive preparation was not used in view of the limited clinical material and the urgency required in helping some of these cases without incurring possible relapse. It was also felt inadvisable to submit so young a group of patients to full control experiments on an out-patient basis. Both the parents and children were interviewed at weekly intervals at the clinic.

Four of the children who were refusing to attend school showed marked signs of improvement within two to three weeks and began to attend school regularly. There was a significant decrease in their anxiety symptoms and in two cases a complete remission of somatic symptoms. One showed no overt improvement and could not be got back to school. Another relapsed during the next term when hydroxyzine medication was discontinued. The remaining three maladjusted children showed moderate improvement. They were found more manageable at home and were described as less excitable although their basic personality difficulties remained unchanged. Their enuresis or encopresis was likewise unaffected. In two cases the parents had noticed somnolence during certain periods of the day.

GROUP IV

Approximately 50 nurses or their adult relatives who were habitual smokers volunteered to try the efficacy of hydroxyzine in controlling the tobacco habit. The trial extended over a period of 4 weeks which was extended for a further 4 weeks in some cases. Each volunteer took one 10 mg. tablet of hydroxyzine t.d.s., no placebo tablets being used. At the end of the experiment each volunteer received a simple questionnaire which he was asked to complete. Only 23 co-operated finally in both completing the trial and returning the questionnaire. Their ages ranged from 19 to 62 with an average age of 43. The classified results from answers to the questionnaire are summarized as follows:

1. Duration of smoking habit in years:
    Average = 23
    Range = 3–38
    Mode = 25

2. Quantity smoked:
    Average = 21 cigarettes per day
    Range = 8–50 cigarettes per day
    Mode = 20

    (Shag and plug translated into cigarettes)

Cigarettes Per Day	No. of People
8–10	4
11–15	3
20	11
20	3
30	1
50	1

3. Motive for wanting to give up smoking:
    As an experiment = 3
    Health reason = 4
    Expense and health = 16

4. Previous attempt at giving up smoking:
    Yes = 16 No = 7

5. Reason for smoking:
   Pleasure = 17 Habit = 6

6. Effects of giving up smoking:
   Increased appetite = 3
   Need of sweets as substitute = 2
   Substitute not required = 18

7. Effects of hydroxyzine on smoking habit:
   Temporarily helpful = 3
   Made cigarettes taste different = 2
   Craving reduced = 4
   Lessened urge = 4
   No effect = 10

   Total helped to resist = 13
   No pipe smokers in this group

8. No. prepared to continue taking hydroxyzine to curb tobacco habit:
   In favour = 7 Not in favour = 16

9. Tobacco reduced or altogether abolished as result of hydroxyzine trial:
   Ceased smoking = 1
   Reduced amount = 3
   No effect = 19

10. Side effects on taking hydroxyzine:
    No unusual feelings = 7 Unusual feelings = 16
    Feelings or sensations attributable to the effect of the drugs:
    Tiredness = 8
    Feeling of relaxation = 6
    Sleepiness = 1
    Loss of sex urge = 1
    Other sensations mentioned were: stomach pains, excessive urination, coated tongue, headache, giddiness, diarrhoea, fainting and retarded thought.

11. Hydroxyzine helpful in resolving emotional problems:
    No help = 21
    Eased depression = 1
    Relieved pain = 1

Evaluation of the results show that 13 found the drug helpful in resisting smoking at least temporarily whilst 16 record various side effects, particularly tiredness. Only 3 found they had reduced their smoking after the course and only 1 gave it up altogether. With the dosage used there is no relationship between the drug and its effect on smoking with regard to age, duration of smoking habit and the amount of tobacco consumed. Statistically it must be admitted that hydroxyzine has no selective action against the smoking habit. Success or failure in this sphere will always primarily depend on proper motivation, but it does seem that, given the will, hydroxyzine would strengthen the means.

Discussion

An attempt was made to test objectively the efficacy of hydroxyzine as a therapeutic agent in a variety of clinical conditions. The experiment was devised to make three main types of observations irrespective of diagnostic considerations, i.e., to establish whether hydroxyzine successfully relieves tension symptoms, reduces overactivity and aggressiveness and improves social behaviour. The symptomatic response of the patients to the drug was the only criterion used in assessing its usefulness. It was never anticipated that it would have a specific effect on the intrinsic nature of either psychotic or neurotic illnesses.

The 81 adult psychotic patients selected for the experiment presented a difficult nursing problem because of their chronic overactive behaviour. It was estimated that if their agitation could be appreciably controlled they would become more responsive to the care and guidance of the nursing staff. This was unfortunately not brought about by hydroxyzine in the more severely disturbed psychotics or in the aggressive, overactive seniles. The effects of hydroxyzine were altogether disappointing in chronic schizophrenics, since only 19 out of a total of 43 showed any definite amelioration in their social behaviour. In these there was an increased desire to participate in the activity of the ward and a reduction in the number of noisy or assaultive outbursts. Those cases who were given a much higher dosage (270 mg. daily) in view of their lack of response were not manifestly improved. Hydroxyzine appears to be of definite value in reducing the overactivity of maniacal patients but it was felt that the 90 mg. dose used daily in the experiment was altogether too small to obtain full sedation, a better response was obtained by giving 270 mg. daily. The restlessness and hostility exhibited by some of the senile and epileptic patients were totally unaffected by the current daily doses used. A number of these patients had to be withdrawn from the experiment as they became unmanageable. By contrast the milder form of senile agitation was successfully controlled and the task of the nursing staff considerably eased. The majority of depressive psychotics were not benefited and the anguish of their depressive mood was in no way relieved; in one case however there was a definite improvement in the accompanying agitation.

Of the 18 patients admitted to the neurosis units only one patient out of the 8 selected (on account of their tension symptoms) was manifestly relieved. The serene tension-free effect reputedly produced by the drug and described by American investigators was not observed. The other two improved patients in this group were depressive cases with secondary anxiety features and have already been referred to. The symptomatic response to the drug in the case of neurotic patients was on the whole disappointing.

The results were definitely more promising with children. No categorical opinion is given however since the number investigated was too small and no control groups existed to match the patients' behaviour under placebos. Nevertheless in most of the cases there was a definite lessening of the heightened emotivity and accompanying restlessness which suggests that the excessive reactivity to anxiety-producing situations is successfully neutralized by hydroxyzine. This has been confirmed by Continental investigators (Bayart *et al.*).

Undesirable side-effects and toxic reactions were relatively few and were not noticeably increased with higher dosage. Perhaps significantly the incidence of side-effects was manifestly higher in the sample of normal population used in the smoking experiment and explains perhaps in part why there was a waning of interest for the trial towards the end since only 23 volunteers out of a total of 50 completed it.

The side effects most often referred to in order of their frequency were: tiredness, sleepiness, stomach pain, diarrhoea, giddiness and headaches. Excessive urination, coated tongue, loss of sex urge and retarded thought were other observations made by volunteers in the smoking experiment. No alteration in the blood picture of any patient was ever detected during the trial when routine blood counts were carried out. There was no appreciable change in blood pressure readings made at weekly intervals. No cases of jaundice occurred. All children used in the trial tolerated the drug well.

SUMMARY

The effects of hydroxyzine were assessed by experimental methods on 99 adult patients of a large mental hospital. Out of a total of 81 agitated psychotics only 31 showed signs of improvement in their social behaviour. In a mixed group of 18 neurotics and mild depressives only 3 had their anxiety successfully relieved by the drug. In the case of 8 children attending a child guidance clinic because of anxiety symptoms associated with behaviour disorder, hydroxyzine produced marked improvement in 4 and moderate improvement in 3.

Fifty nurses volunteered to test the efficacy of hydroxyzine in controlling the smoking habit, 23 completed the experiment, 13 found the drug helpful, 16 complained of side effects, only 3 reduced their smoking and one gave it up altogether.

It is difficult to make authoritative claims on the efficacy of hydroxyzine as a therapeutic agent in the treatment of large patient populations when it is realized that only a third of the total adult material utilized made a positive response to the drug. When finally evaluated, results can be summarized as follows:

(*a*) Definitely promising in children because of marked reduction of anxiety.
(*b*) Useful in disturbed seniles (mild cases).
(*c*) Of little value in the restless, aggressive psychotics.
(*d*) Of no manifest benefit in neurotics.
(*e*) Does not demonstrably counteract the smoking habit.

ACKNOWLEDGMENTS

We are indebted to Dr. J. A. Ainslie, Physician Superintendent, St. Augustine's Hospital, Chartham Down, and Dr. F. B. Charatan, Consultant Psychiatrist, for their encouragement and criticisms. Acknowledgments must be given to the nursing staff of St. Augustine's Hospital for their help and active co-operation, and to Pfizer Ltd., for supplying active and placebo tablets.

Our thanks are also due to Mr. J. Lindsay, Clinical Psychologist, for his suggestions and analysis of results in the smoking experiment, and to Mr. W. D. Sweeting, Hospital Pharmacist, for his help in the clinical trials.

REFERENCES

BAYART, J., "Treatment of nervous conditions in infancy with hydroxyzine", July, 1956. *International Pediatric Congress, Copenhagen.*

FARAH, L., "Preliminary study on the use of hydroxyzine in psychosomatic affections", June, 1956. *International Record of Medicine and A.P. Clinics.*

FOUKS, *et al.*, "Notes sur l'utilisation en psychiatrie d'un nouveau neuroleptique", *Ann. Méd. Psychol.*, 1956, **1**, 605. April.

ROBINSON, H., "Hydroxyzine (Atarax) in Dermatological Therapy", *J. Amer. Med. Ass.*, 1956, **161**, 7.

SEGAL, L. J., "A clinical trial with hydroxyzine (Atarax) on a group of maladjusted educationally subnormal children", *J. Ment. Sci.*, July, 1957.

SETTEL, E., "Clinical observations on the use of hydroxyzine (Atarax) in tension states".

SHALOWITZ, M., "Hydroxyzine a new therapeutic agent for senile anxiety states", *Geriatrics*, July, 1956.

CLINICAL TRIAL WITH TRINURIDE

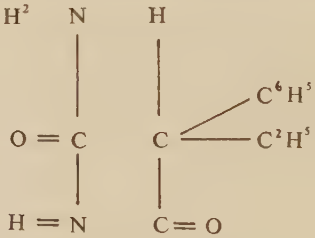
By

D. S. SHARPE, M.R.C.S., L.R.C.P., D.P.M.
G. DUTTON, M.B., B.S.
and
J. R. MIRREY, M.B., B.S.
Botleys Park Hospital, Chertsey

SPIELMAN and his colleagues (1948) were initially responsible for demonstrating the anti-convulsant action of the acetylurea derivatives. However, it was not until several years later that comprehensive studies were carried out by Professor Frommel in Geneva (1953).

Frommel and his associates carried out extensive laboratory experiments on animals to demonstrate the anti-convulsant action of phenylethylacetylurea (P.E.A.U.). His work also included investigation into the toxicity of the drug.

As this drug is at present little known in Great Britain, the following brief introduction to its structure and pharmacology may be of interest. The compound belongs to the acetylurea derivatives, one of which, phenylacetylurea, has already been shown to have marked anti-convulsant properties. This compound, however has proved too toxic for general use. Phenylethylacetylurea has the following structural formula, which resembles that of phenobarbitone.



Though by itself the drug has shown considerable anti-convulsant properties its effects were enhanced by combining it with other anti-convulsants. Originally a combination with phenylacetylurea was prepared. However, owing to the toxicity of this latter drug, a combination with diphenylhydantoin was adopted. In addition phenobarbitone has been incorporated into the compounds.

Thus in Great Britain the compound known as trinuride has been introduced. This has the following combinations:

Phenylethylacetylurea	0·20 gm.
Diphenylhydantoin	0·04 gm.
Phenobarbitone	0·015 gm.
Excipient	0·4 gm.

It is with this compound that we have undertaken the clinical trial now described.

Of previous clinical trials with P.E.A.U., one of the first was that carried out by Walther (1951). This study was primarily prompted by the investigation of toxicity and only 6 out of 10 cases were epileptics. Much more comprehensive work was carried out by Sorel and de Smedt at Louvain (1953). They showed clinically that one-third of their cases improved considerably, one-third were slightly improved whilst the remainder showed no change.

To us these results were of considerable interest, as 31 of these cases were regarded as oligophrenics and had in the majority shown resistance to previous forms of treatment. More recently Sorel (1957) has compared the action of trinuride with several well-known anti-convulsants. Conspicuous results were also obtained by von Soyter and J. Fässler (1956) of the Steinen Children's Sanatorium in Raphaelstein.

CLINICAL TRIAL

The discovery of a drug which will control or abolish the convulsions of grand mal epilepsy is always of paramount importance to those who care for the epileptic patient. Apart from the control of the convulsion, the drug must exert little or no side effects. It should therefore permit the epileptic patient to undertake his daily routine with the minimum of inconvenience.

It is with these thoughts in mind that we have carried out the following clinical trial using trinuride. We feel that though of recent years there have been a number of new anti-convulsants placed on the market, there is still scope for further investigation into drug therapy for the control of epilepsy.

We have also aimed at the observation of any toxic effect which may be produced over the period of use of the drug. Another factor which we stress is the observation of any change in the behaviour state of the patient, a factor of considerable importance to those who actively nurse the patient.

Unfortunately the EEG examination was not available for the patients within this trial group. We have therefore based our results purely on clinical observations.

The material used consisted of 32 resident patients of Botleys Park Hospital, all of whom were certified mental defectives. They consisted of an adult group of 27 patients, aged from 16 to 51 years, and a smaller group of 5 children, aged from 6 to 13 years. The I.Q. ranged from 30 to 70+. Previously all the patients used were under treatment with phenytoin, primidone and phenobarbitone, either alone or in combination.

METHOD

As we have stated, all the patients used in this trial were already undergoing drug therapy. Thus it was necessary to employ the well-known addition, substitution and withdrawal technique. The following scheme was therefore employed for our adult patients.

First week	One tablet of trinuride was added to the existing drug.
Second week	Two tablets of trinuride (one morning and evening) was commenced and if the patient was already on phenytoin, this was reduced by $1\frac{1}{2}$ grains per day.
Third week	The trinuride was increased to 3 tablets per day (1 t.d.s.). The phenytoin remaining was stopped.
Fourth week	The trinuride was increased to 4 tablets per day (2 tablets b.d.). Further reduction of phenobarbitone and any other anti-convulsant above.
Fifth week	Trinuride increased to 5 tablets per day (2 morning and evening and one midday). Phenobarbitone stopped.
Sixth week	Increased if necessary to 6 tablets per day (2 t.d.s.).

We must emphasize that it is important that this process of transition should not be hurried.

We attempted to control our cases using trinuride alone, but in 3 cases a little additional phenobarbitone and in one case phenytoin had to be given. It should of course be remembered that 4 tablets of trinuride contain approximately 1 grain of phenobarbitone.

With our children we employed a similar substitution scheme but did not increase the trinuride to more than 3 tablets per day. It is to be noted that all the children concerned were more than 5 years. The makers recommend that for children under 5 years not more than one tablet daily should be given.

The trial took place under hospital conditions and lasted for a period of six months. We feel that this is the minimum period for the assessment of any anti-convulsant.

Mindful that we wished primarily to observe the action of the drug on grand mal epilepsy we have used the following schemes. Three distinct categories have been created based on the number of grand mal attacks over an equivalent 6 monthly period before and during the course of the trial.

Thus we classify as "improved" the patient who shows a decrease of more than 25 per cent. in the number of convulsions. They were recorded as "worse" if the convulsions had increased by more than 25 per cent. No change occurs in the intervening group who have neither more nor less than 25 per cent. ni the number of convulsions.

The following, therefore, are the tabulated results showing effect of trinuride on grand mal epilepsy amongst our adult male and female groups.

Grand Mal Convulsions	Number of Cases	Percentage
Worse	7	26
No change	10	37
Improved	10	37
Total	27	100

Nine of the above had concomitant petit mal epilepsy. With this condition, unless clinically there is very marked improvement, we think that it would be unwise to venture much comment without the evidence of EEG. All that we can say regarding petit mal is that we found no evidence of any marked change in any of our cases.

Close observation was made to observe any behaviour change. It was noticeable that during the initial period of transition some of our cases became very restless. We supposed that this was due in part to the reduction of barbiturate intake and also to a certain degree of excitation caused by the P.E.A.U., a fact first noticed by Sorel and de Smedt (1953). Final assessment of our adults shows that 2 cases demonstrated marked improvement in behaviour and conduct. Twenty-two showed no appreciable change whilst 3 cases were worse.

During the course of the trial, one of our adults unfortunately died; the cause of death was not related to the trinuride—post-mortem examination showed a cerebral tumour. We have not included this patient in our results as he died before a period of assessment could be made.

The drug was also tried on a case of epiloia with chronic cardio-vascular disease, but had to be discontinued because of deterioration of the patient's physical state before any assessment could be made. Having knowledge of this patient's previous condition, we do not feel justified in holding the trinuride responsible for his deterioration. These two cases have accordingly not been included in the results tabulated above.

The results observed in the group of children are tabulated below.

Age	No. of Convulsions Before Trial (Gm. per Month)	No. of Convulsions During Trial (Gm. per Month)	Remarks
10	4	9	Marked behaviour change
13	7	12	
9	10	4	Lethargy
9	2	7	Lethargy
6	2	2	No change

The behaviour change noted in the first two children related to an exaggeration of the uncontrolled impulsively aimless behaviour so common amongst certain epileptic children. In these two cases, this behaviour became so severe that treatment had to be discontinued. This type of change had been noted by Krauss (1957). Finally, there was no significant relationship between results and the I.Q. rating of the patients.

Toxic and Side Effects

As this drug combination has not as yet been widely investigated in this country, we thought it advisable to carry out the following scheme of laboratory investigation.

1. *Blood Count.* Red and white cell count, haemoglobin estimation by the alkaline haematin method and a differential white cell count.
2. *Liver Function Tests.* Total serum proteins were estimated by the Biuret method and fractionation was carried out by electrophoresis in a barbitone buffer at pH 8·6, zinc sulphate flocculation test by the method of Kunkel. The formal gel test.
3. *Urinalysis.* Routine examination of the urine was by Benedict qualitative method for copper reducing substances, salicylsulphonic acid test for protein and examination of the centrifuged deposit.
4. *Amino Acid and Indole Excretion Patterns.* These were assessed by the two-dimensional paper chromatograph technique on urine.
5. *Blood Urea.* This was estimated by the urease-nesslerisation method.

These investigations with the exception of the blood urea were all carried out before the start of the clinical trials. Then, after commencement, urine analysis was carried out weekly. At monthly intervals, blood counts were performed and at three-monthly intervals a complete examination as detailed above performed. This was again repeated at the end of the trial.

Results

(a) *Haemopoietic System.* There was no evidence of any deleterious effects of trinuride on this system.

(b) *Liver Function.* The tests employed did not reveal any changes in liver function as a result of trinuride therapy. The excretion patterns of amino acids and indoles showed no significant changes.

(c) *Urinary System.* Apart from occasional traces of glucose, which occurred in five cases, the only other abnormality detected was protein. Eleven of our cases showed a trace of albumin at some time. In only 2 of these cases did it persist for subsequent examination. However in spite of continuation of treatment, they had all cleared up at the termination of the trial. The results of the blood urea revealed that in no case was the amount present in excess of the upper limit of normality.

In general, we observed no purely clinical side-effects such as exanthema or gastric intolerance.

Discussion

On analysis of the results of this trial, it will be evident that trinuride possesses marked anti-convulsant properties especially related to grand mal epilepsy. Thus we found that 37 per cent. of our cases of grand mal epilepsy were improved. This conclusion is enhanced when we consider that another 37 per cent. showed no change and that these cases had all previously been controlled, as far as possible, by other anti-convulsants. The inference is that trinuride is an efficient anti-convulsant in comparison with others in general use today.

We have been unable to observe any marked improvement in general behaviour and mental state such as observed by Ruggeri and de Sanctis (1952). This may in part be due to the type of patients we had used in the trial. It must be remembered that they were all mental defectives, some with I.Q.s of less than 30, at which level improvement, unless dramatic, cannot readily be obtained or assessed.

We feel that the true value of this compound may well be best shown in the study of the epileptic found among neurological out-patients. Here the stimulating effect of the P.E.A.U. may help to counteract the depressive side-effects of the barbiturates.

In considering the results which we obtained with the children, it is obvious that our numbers are too small to be of significant value. However, we do feel that these poor results were possibly due to increased excitation during the transition period. This excitability has already been mentioned in relation to our adults. We feel however that the children, having been for the most part under treatment for epilepsy for a shorter period than the adults, may be more prone to the effects of a stimulating drug. Thus from our experience we would recommend that in children great care should be taken during the transition period not to remove too much barbiturate until the child is well established.

In general our impressions are that though this is not an easy drug to control during the transition period, when this is passed it is remarkably free from troubles.

From the results of our laboratory investigations, it can be seen that both the haemopoietic system and the function of the liver are unaffected. However, in dealing with the urinary system we did observe traces of albuminuria. We do not wish to ignore such a finding, but in spite of continuation of treatment this condition was only transitory and at the end of the trial all cases were free from proteinuria. Further, no blood urea was shown to be above the level of normality. The appearance of a trace of glucose seems to be of no significance, as the amounts were small and did not persist. It is however of interest to note that Frommel (1957) has detected a similar substance in his laboratory animals which were undergoing investigation with trinuride. Additional evidence against any toxic action in the kidney is revealed in the case that died. Here histological examination of the kidneys showed no evidence of toxic damage. Thus it may well be that our findings are of little significance.

Our final conclusion is that trinuride is a compound with considerable anti-convulsant properties when used in the treatment of grand mal epilepsy. It is well worthy of further trial.

SUMMARY

In this paper, a clinical trial was carried out using the compound trinuride.

Twenty-seven adults and five children all suffering from grand mal epilepsy were given the drug for a period of 6 months.

The results showed 37 per cent. improved; 37 per cent. no change; 26 per cent. worse in adult cases.

The results with the children were poor and are detailed in the text. Full investigation of any toxic properties were undertaken. The only evidence of any disturbance was the appearance of some transient trace of albuminuria.

ACKNOWLEDGMENTS

We have to thank Dr. J. M. Crawford, Physician Superintendent of Botleys Park Hospital, for permission to publish this paper. We are also indebted to Dr. B. Gordon of Bengué & Co. Ltd., for the supply of the drug used in this trial. Finally, we must thank Professor Frommel and his associates in the Institute of Medicine of Geneva for their advice and helpful criticism.

REFERENCES

FROMMEL, E., *et al.*, *Arch. Int. Pharmacodym.*, 1953, **92,** 368.
Idem, personal communication.
KRAUSS, S., personal communication.
RUGGERI, R. L. D., and DE SANCTIS, T., *Riv. sper. Freniat.*, 1952, **764.**
SOREL, L., and DE SMEDT, R., *Acta. Neurol. Psychiat. Belg.*, 1953, **8,** 531.
SOYTER, E. VON and FÄSSLER, J., *Schweiz. Med. Wschr.*, 1956, **34,** 956.
SPIELMAN, M. A., GEISLER, A. O., and CLOSE, W. J., "Anti-convulsant drugs", *J. Amer. Chem. Soc.*, 1948, **70,** 4189–4198.
WALTER, S., *Praxis*, 1951, **51,** 1954.

PSYCHIATRIC AND ELECTRO-ENCEPHALOGRAPHIC STUDIES IN SOCIALLY ADJUSTED OLD PEOPLE

By

W. L. McADAM, M.D., M.R.C.P.I. D.P.M.

and

R. A. ROBINSON, M.B., B.Ch., D.P.M.

From the Department of Clinical Research, Crichton Royal, Dumfries

In earlier studies from this department (Robinson, 1955; McAdam and Robinson, 1956) it was shown that in senile and arteriosclerotic deterioration a correlation existed between the degree of deterioration assessed clinically and the amount of abnormal low frequency activity observed in the EEG. The relationship had for the first time been quantitatively demonstrated, but we had no precise knowledge of the EEG or clinical profiles presented by a group of "normal" old people. In our hospital patients, the amount of deterioration extended over a very wide range, from mild forgetfulness to severe dementia.

The series to be described in this paper was one in which we believed that in neither dimension of measurement (clinical or EEG) would gross abnormalities be likely to occur. If it could be shown that they were in fact rare, some validation would be given to the pathological assessments we had devised. Further, if they were of approximately equal rarity in the clinical and EEG dimensions, and if their occurrence tended to coincide in the same subjects, further support would be given to our belief in the quantitative relation between them. With these hypotheses we approached the present study.

MATERIAL

Our subjects were drawn from a local Old People's Club. We relied on volunteer subjects, as a random sample would have been difficult to administer; partly because of the relatively small population to which we had access, and partly because a fear of being associated with the mental hospital might have deterred many of our subjects. The relatives and friends of our volunteers regarded them as "normal" old people. Colleagues who carried out parallel studies found them to be a reasonably homogeneous group in respect of activity, intelligence, and social and economic status. Some of this work has been published (Orme, 1957), and another paper is in preparation, and we will not therefore comment further on these aspects of our case material at this stage.

METHOD

Our methods of EEG and psychiatric examination have been described (Robinson, 1955; McAdam and Robinson, 1956). The EEGs were reported in the course of routine hospital and out-patient diagnostic sessions, and they were there and then briefly described and assessed as normal, borderline or abnormal. The criteria of abnormality used here is that published by Hill and Parr (1950). The EEG reporter (W.M.) had no access to the subjects or to the case notes.

There was no opportunity for detailed physical examination, and as we had no control over the selection we had to accept many subjects who had manifest physical disabilities. These included, for example, evidence of cerebral damage, such as hemiplegias and dysphasias; and had we been making our own selection, many such subjects would have been excluded, in view of the fact that focal cerebral disease, and certain systemic diseases, can modify both the EEG and the intellectual performances. We had no reliable information as to the nature of the relationship between EEG and intellectual abnormalities in such cases, though Wiener and Schuster (1956) have shown that a relationship exists.

FINDINGS

On the psychiatric rating scale almost all the subjects did well. Out of our total of 55, 37 achieved a score of 16 or above on the scale; whereas in our hospital series of 50 patients, only 2, similarly tested, scored so well. The rating scale was, of course, designed for deteriorated patients. In the present series, those who scored 16 or over were considered "not deteriorated" and no attempt was made to sub-divide this group.

In those EEGs which showed abnormality, none showed enough to justify their being given a grading below that of the "mild" group of our preliminary study (Robinson, 1955). In all, 15 records were considered to show definite though slight abnormalities.

In those 37 who were "not deteriorated", abnormal EEGs were found in 6, and physical disabilities were noted in 14. These included mild and controlled diabetes mellitus (4) and healed coronary artery disease without symptoms (2). In these the EEG was normal. There was 1 mild degree congestive heart failure with a borderline EEG and 3 with intermittent claudication, 2 with a normal and 1 with a borderline EEG. There were 6 cases with more manifest cerebral involvement—4 with hypertension and attacks of giddiness, of whom 2 had abnormal EEGs and 2 who had hemiparesis and "blackouts", both having abnormal EEGs.

In the "slightly deteriorated" group of 18 subjects, physical disabilities were noted in 7, and abnormal EEGs in 9. In 3 with hypertension and giddiness, EEG abnormalities were noted in each. In 2 with dysphasia, 1 had an abnormal EEG. The remainder were 1 of Parkinsonism, with an abnormal EEG, and 1 of congestive heart failure, with a normal EEG.

Thus, out of 21 in whom physical disabilities were noted, there were 11 in whom there were strong grounds for believing that there was organic cerebral involvement, and in 8 of these the EEG was abnormal. The proportion of cases with suggestive or manifest indications of cerebral involvement was almost twice as high in the group which showed intellectual impairment as in the intellectually normal group—28 per cent. and 16 per cent. respectively. In the other physical disabilities noted, the EEG was normal except in 1 of congestive heart failure which was borderline.

No consistent pattern of EEG abnormality could be found to correlate with the physical disabilities. There were cases of polyrhythmic dysrhythmia: of "slowed alpha" of 7 c.p.s.: of localized and of generalized abnormality. The poor information that we possess on the physical health of our subjects would in any case make it unprofitable to attempt a close correlation with the EEG. Whether or not the EEG patterns can show any correlation with other modalities including psychological test material will be the subject of a further communication.

The following table summarizes the relationships between the EEG and the clinical scores:

Table Showing Distribution of EEG Categories Between "Not Deteriorated" and "Deteriorated" Subjects in the Whole Series, and the Same (in brackets) when Subjects with No Significant Physical Disability are Excluded

	Clinical Score	16 and Over	Less than 16
EEG	Normal	28 (15)	6 (2*)
	Borderline	3 (2)	3 (1)
	Abnormal	6 (0)	9 (4)

* Excludes also 3 who refused the serial sevens test, which we thought (R.A.R). they were capable of performing adequately.

It can be seen that for the whole series there is grouping of normal EEGs with "not deteriorated" subjects and of abnormal EEGs with the "slightly deteriorated". Applying the χ^2 formula we get a probability of less than 1:100 that this relationship might occur by chance. When significant physical diseases are excluded we get a considerably better grouping of the same order. We cannot, however, attach much weight to the latter, in view of the sophistication of the selection and rejection for this group and of our necessarily imperfect information on the disabilities that led to rejection.

Using Student's t test we found no significant difference in the mean ages of the two clinical groups. The average age of the "not deteriorated" group was 69; and of the "deteriorated", 70·5.

Our findings support the views that in old age the early appearance of intellectual impairment can be expected to accompany minor signs of abnormality in the EEG; and the presence of a normal EEG greatly diminishes the probability that any intellectual impairment of senile-arteriosclerotic type is present.

DISCUSSION

Our findings supplement those of our earlier studies which led us to conclude that increasing signs of intellectual deterioration in old age are accompanied by increasing abnormalities in the EEG. Mengoli (1952) noted that in "normal" subjects great age could be reached without any sign of EEG alteration, while in subjects with brain diseases, the distribution of EEG patterns was most irregular, the same disease being accompanied in one case by a normal and in others by varied patterns of abnormal EEG. Obrist (1954) used as criteria of normality that the subjects were ambulatory, non-hospitalized and non-psychotic. He found that the outstanding characteristic of the EEG in normal old age is a slowing down of the alpha rhythm and a slight increase in the incidence of delta wave activity. It will be noted that all the individuals in our present series were "normal" according to these criteria: and that a different concept of "normality" leads to the elucidation of relationships otherwise obscured. Similar comment applies to the paper by Mundy-Castle and his associates (1954), who studied 50 "mentally normal seniles" defined as showing "no considerable disturbances of memory, orientation or coherence of thinking". In this group they found that 24 per cent. possessed abnormal EEGs. Silverman *et al.* (1955) found relationships between the EEG and age, socio-economic level, and evidence of organic deterioration, such as perseveration of speech and poverty of ideas. Subjects showing these signs had records with mixed and diffuse abnormalities. There tended to be greater numbers of abnormal records in succeeding decades, and less in higher socio-economic groups. However in a later paper (Busse *et al.*, 1956) in which a larger community group was studied in more detail, the use of Wechsler Intelligence Scales and the Fischer Maladjustment Scale derived from Rorschach data failed to differentiate between EEG groups. Maggs and Turton (1956) considered a group of persons over 60 and leading a normal home existence. These were controls for a group of elderly subjects suffering from affective disorder subdivided into two groups according to whether the age of onset was below or above 60 years. They found no definite difference in record type between the three groups; and concluded that "both the borderline records and those with an excess of slow activity should be largely neglected in assessing the prognosis of any individual case . . . and are not in fact causally related to either an involutional depression or an early organic dementia".

None of these authors produces information which supports our conclusion. It is to be noted that the concept of "normality" has not been used by us in categorizing our cases. We were obliged to accept the term as it was used by our volunteers, in the reasonable assumption that it would imply considerably better levels of ability to adapt to society out of hospital than was found in our earlier cases, who were admitted because such adaptation had broken down. We assumed also that in those who were still able to adapt, out of hospital, there might be different levels of ability; and our clinical rating scale is an admittedly crude device for obtaining a numerical rating for such level of ability. It appears to us that the findings of the authors referred to above are not in disagreement with ours; but merely that our use of an additional scale of measurement has permitted us to extract more information from comparable material.

SUMMARY

Fifty-five volunteers from an Old People's Club were subjected to psychiatric and EEG examination. In thirty-seven there was no evidence of intellectual impairment. In fifteen there were signs of a very minor degree of impairment. There were thirty-four who had normal EEGs and fifteen who had abnormal EEGs. The distribution of psychiatric and EEG normality and abnormality was found to correlate significantly.

ACKNOWLEDGMENTS

We are grateful to Dr. P. K. McCowan, recently Physician Superintendent of this hospital, who permitted and criticized this work: to Miss B. Corrie for the EEG recording and administration: and to Mrs. N. Thomson for statistical criticism. The work forms a part of a larger survey which was made possible by a grant from the National Corporation for the Care of Old People, to whom we express our thanks. The whole work was under the general supervision of Dr. A. C. Tait, Director of Clinical Research.

BIBLIOGRAPHY

1. BUSSE, E. W., BARNES, R. H., FRIEDMAN, E. L., and KELTY, E. J., *J. Nerv. Ment. Dis.*, 1956, **124**, 2.
2. HILL, D., and PARR, G., *Electroencephalography*, 1950. London: MacDonald & Co. p. 379.
3. MCADAM, W., and ROBINSON, R. A., *J. Ment. Sci.*, 1956, **102**, 819.
4. MAGGS, R., and TURTON, E. C., *ibid.*, 1956, **102**, 812.
5. MENGOLI, G., *EEG Clin. Neurophysiol.*, 1952, **4**, 283.
6. MUNDY-CASTLE, A. C., HURST, L. A., BEERSTECHER, D. M., and PRINSLOO, T., *ibid.*, 1954, **6**, 245.
7. OBRIST, W. D., *ibid.*, 1954, **6**, 235.
8. ORME, J. E., *J. Ment. Sci.*, 1957, **103**, 821.
9. Robinson, R. A., in *Old Age in the Modern World*, 1955, p. 433. (Report of the Third Congress of the International Association of Gerontology, London, 1954). Edinburgh and London: Livingstone.
10. SILVERMAN, A. J., BUSSE, E. W., and BARNES, R. H., *EEG Clin. Neurophysiol.*, 1955, **8**, 479.
11. WEINER, H., and SCHUSTER, D. B., *ibid.*, 1956, **8**, 479.

HEPATO-SPLENOMEGALY COMPLICATING ONE OUT OF 4 CASES OF LAURENCE-MOON-BIEDL SYNDROME IN A GROUP OF SEVEN SIBLINGS

By

FREDERICK E. KRATTER, B.Soc.Sc., M.B., Ch.B., D.P.M.
Lecturer in Mental Deficiency
University of North Carolina, Chapel Hill, North Carolina

The Laurence-Moon-Biedl syndrome shows much variation in its clinical picture from case to case and the limits of this syndrome are indefinite. This clinical entity was first identified by J. Z. Laurence and R. C. Moon in 1866 and was more completely described by A. Biedl in 1922. In 1935, Cockayne, Krestin and Sorsby stated that some 30 isolated cases and 15 affected families were reported during the ten years from 1925 to 1935, and in 1939 Sorsby, Avery and Cockayne made a later review. In October, 1955, J. Todd described a case of Laurence-Moon-Biedl syndrome with paranoid psychosis in the *American Journal of Mental Deficiency*, and in 1950 R. A. Burn reviewed 82 cases giving the total number of reported cases as 260. Up to 1957 about 320 cases have been described in the world literature but even this number is likely to rise with the increased interest shown in this syndrome.

In its complete form this clinical entity is characterized by the cardinal signs of mental deficiency, hypogenitalism, obesity, pigmentary retinal degeneration (retinitis pigmentosa) and polydactyly.

When some of the above described signs are absent, the syndrome is generally referred to as "incomplete" or "forme fruste". A diverse variety of other findings have been described such as nystagmus, strabismus, congenital heart disease, syndactyly, diabetes mellitus, skin pigmentation, deaf-mutism, enuresis, spinal deformities and cerebral degeneration.

The Laurence-Moon-Biedl syndrome is not infrequently found in several members of the same family and particularly so in siblings of both sexes. It is a heredo-familial disorder and relatively rare. The variety and divergence of the symptoms have stimulated various genetic theories the most satisfactory being the one which attributes it to an autosomal recessive. The epi- and meso-blastic anomalies are ascribed to two separate abnormal genes carried in the same chromosome.

CASE I

History of R.H.

This boy was 10 years 5 months old, 57 inches tall and 150 pounds in weight when he entered our school. His appetite has always been excessive which accounts for his obesity. The mother stated that he consumed the greater part of her time and energy and added that her boy had become unduly sensitive to the remarks by others regarding his size and appearance. She considered it unwise for him to remain at home with the other children or at school because he was such an excitable and impressionable child. Otherwise he was trustworthy, truthful and easily manageable.

R.H. was delivered at full term without the use of instruments and he was considered a fine, strong baby. He weighed at birth seven and a half pounds and was the fifth child of a group of seven siblings (two infants are deceased). According to the mother, he seemed quite normal as a baby except for having supernumerary fingers and toes. There were no feeding troubles; he was breast-fed and generally considered a "very good and quiet" baby.

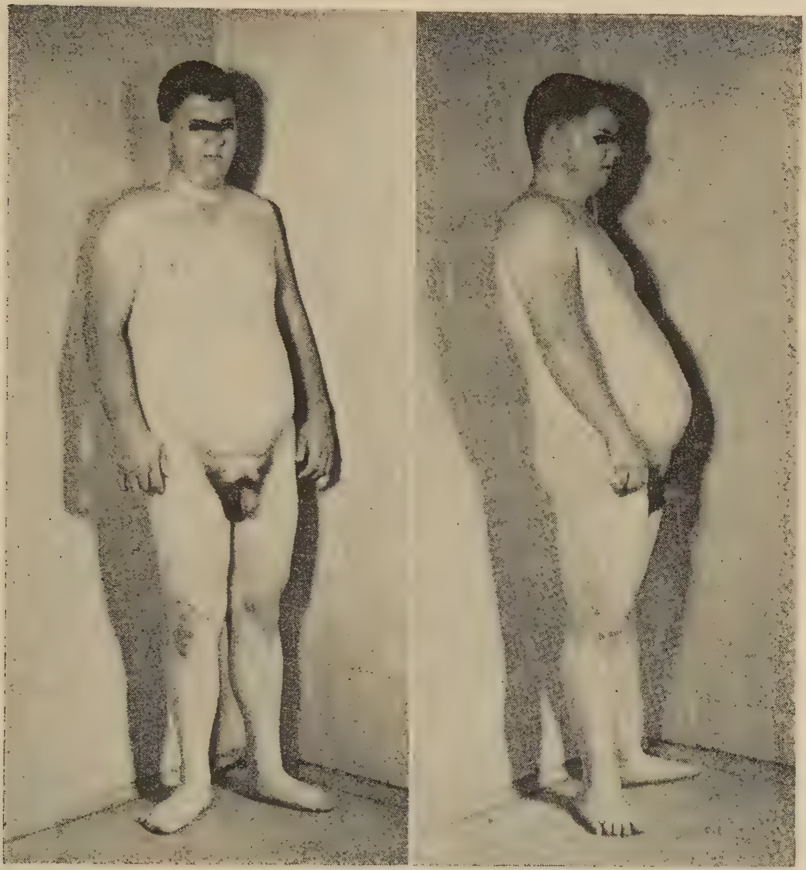


FIG. 1.—Laurence-Moon-Biedl Syndrome, complete form, associated with congenital cardiac defect.

The mother feared that he would not acquire the skill of sitting up unaided owing to the weight and size of his trunk. However, he finally succeeded in raising himself when he was eight months old. At six months he sustained a series of convulsions following a severe attack of measles and influenza. A cerebro-spinal puncture relieved his seizures but left him in a severely debilitated condition for several weeks.

He attended special classes at the local school where he had difficulty in joining his school mates in games and exercises, making little academic progress owing to an eye defect. He was fond of singing and music lessons in which he competed well with the children of his school. Psychometric test data revealed the following information.

4 November, 1937, C.A., 9–3, M.A., 4–2, I.Q., 45, Stanford-Binet (1916).

3 February, 1939, C.A., 10–6, M.A., 3–11, I.Q., 37 Rev. Stanford-Binet (1937).

His father, aged 59, married at the age of 22 years. He has a medical history of cardiac disorder, diabetes mellitus and varicose ulceration of legs. He is described as being an irritable man of dull normal intelligence, requiring social and economic assistance. The mother who is fifty-two, married at the age of 21. She is a healthy, well-preserved woman looking much younger than her age would indicate. She is free from any sensory defects and gives the impression of being more alert and active than her husband. The paternal and maternal grandparents were in fairly good physical and mental health except that the paternal grandfather suffered from diabetes mellitus and obesity. One paternal grand-uncle had cardio-vascular disease associated with hypertension, obesity and visual defects. There were seven siblings including R.H. The oldest boy, J.H., is in good general health and so are his sisters R.H. and C.H.; the latter had infantile paralysis in early childhood. She now wears a brace on her right leg. K.H. and C.H., a baby boy and girl, are both deceased. K.H. died at the age of eleven months. He had supernumerary fingers (6) on his right hand and extra toes (6) on his right foot, was very obese and suffered from a visual defect. He apparently was a case of "the complete form" of the Laurence-Moon-Biedl syndrome. His younger sister, who died at the age of 5 months, also was obese with extra digits (6, left hand). She probably was a victim of this familial condition, too.

H.H., is the youngest female sibling; she is very obese, partially blind and mentally retarded; in addition she reveals a congenital heart condition, hypoplastic genitals and a pronounced hepato-splenomegaly. This case is described below in greater detail.

The physical examination of our patient R.H., who is an obese young man of 28 years and 10 months, 241 pounds in weight without clothes and 70¼ inches in height, discloses the classical signs of this familial disorder. His I.Q. is 33 as measured by the Hayes-Binet Tests for the blind, placing him in the mid-grade, trainable group of defectives. His head is somewhat large and round, the cranial circumference being 22½ inches. His eyes are blue and his skin clear and free from moles or pigmentation. He is almost blind now, having to be guided around his living unit. His eyes display slow, sweeping movements of large amplitude which are referred to as searching movements. His ears, nose, throat, larynx and pharynx are clinically negative and the lungs are normal to percussion. On auscultation sibilant rhonchi can be heard over both lung areas. Rales are heard over the left pulmonary base. The cardiac apex is displaced half an inch laterally to the mid-clavicular line being placed within the left 5th intercostal space. There is a harsh systolic murmur over the pulmonary area the thrill being palpable over the upper end of the sternum. From there it is transmitted to the tip of the left scapula. The cardiac findings apparently denote a congenital cardiac lesion. The blood pressure is 150/85 and there is a moderate swelling over the outer malleolar areas pitting slightly on pressure. The examination of the abdomen is essentially negative. The spleen is not palpable; the liver, however, is enlarged, slightly tender to touch and about one inch below the right costal margin. The genitals are hypoplastic—the penis being 1½ inch in length, one testicle remaining undescended, and the other slipping readily in and out of the inguinal canal on light digital manipulation. There are six fingers on his right hand which are long and tapering, the two little fingers being fused the entire length of their middle and distal phalanges (syndactyly); there also are six toes on his right foot. The examination of the central nervous system reveals pupils which are rather large and round, responding sluggishly to light and accommodation. The ocular fundi disclose pale discs particularly over their temporal portions as well as diffusely placed pigmentary deposits of stellate-shaped configuration in the retina. The vessels are narrowed and the chorioid layer is prominent in several areas. The tendon reflexes of the upper and lower extremities are brisker than normal and the plantar reflexes are of the flexor type. The left and right abdominal reflexes are absent. His gait is broad-based, slow and guarded. The roentgenological report states that the right hand and right foot reveal

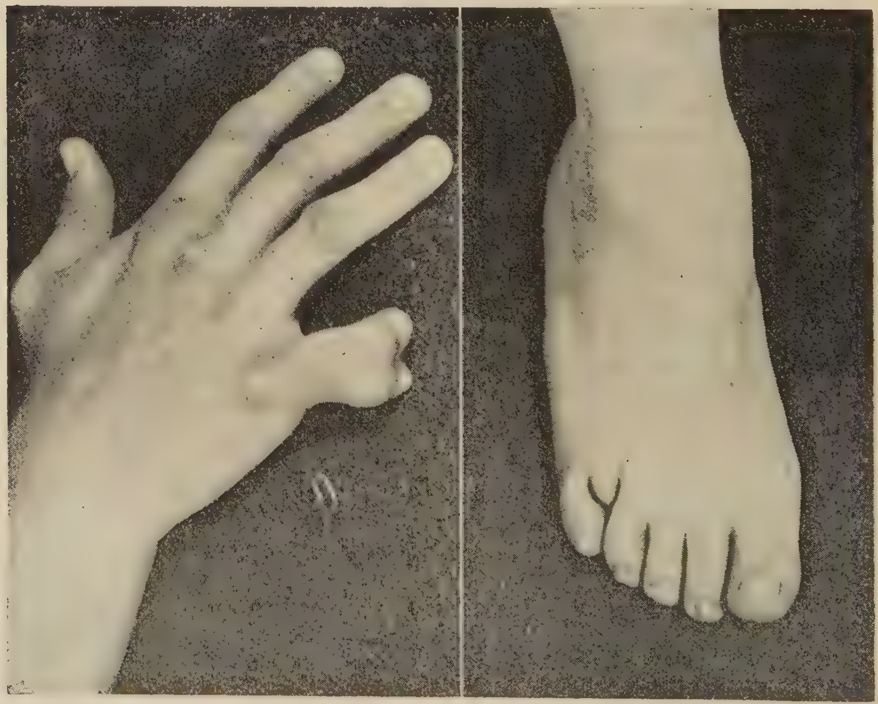


FIG. 2.—Syndactyly of little finger on right hand. Polydactyly right foot. Distal portion of 5th toe was amputated in childhood.

supernumerary digits (6). There also is an old fracture of the navicular bone in the right wrist. The skull and lumbo-sacral films are negative. The laboratory investigations disclose a sedimentation rate of 4 mm., haemoglobin 13·8 gm. per cent., white blood cells 4,500 72 polys, 2 eos, 24 lymphs, 2 monos and 190·000 platelets. Urine analysis is negative.

Clinical findings are: Obesity, mental deficiency, congenital heart disorder, hypogonadism retinitis pigmentosa, polydactyly and syndactyly.

Final diagnosis: Laurence-Moon-Biedl Syndrome.

CASE II

History of H.H.

H.H. is R.H.'s youngest sister. She is a twenty-two year old, single girl, the product of a normal, full term pregnancy and delivery. She weighed nine pounds at birth and except for being overweight, her parents thought she developed normally. She walked at the age of fourteen months and began to say a few words a little later. Her parents believed she was quite normal intellectually until she attended school where she was found to be backward in learning. Her eyes gave her a lot of trouble and as her brother was similarly affected, her parents assumed that this handicap was the cause of their daughter's poor scholastic progress. However, she continued to go to school for several years, being socially advanced, until she became "physically too big and obese to fit into the school desks". She has never had any serious illness but has been prone to colds. Her menstruation commenced at the age of nineteen years. The periods, however, have been grossly irregular and scanty and the discharge was yellow and at times brown, blood tinged or even straw-coloured. In May of 1956, she had an attack of menorrhagia (aèt. 21) and ceased having any further periods since.

Due to water retention and a ravenous appetite her size and weight continued to increase steadily. Mercurial diuretics, ammonium chloride and a special diet somewhat reduced her

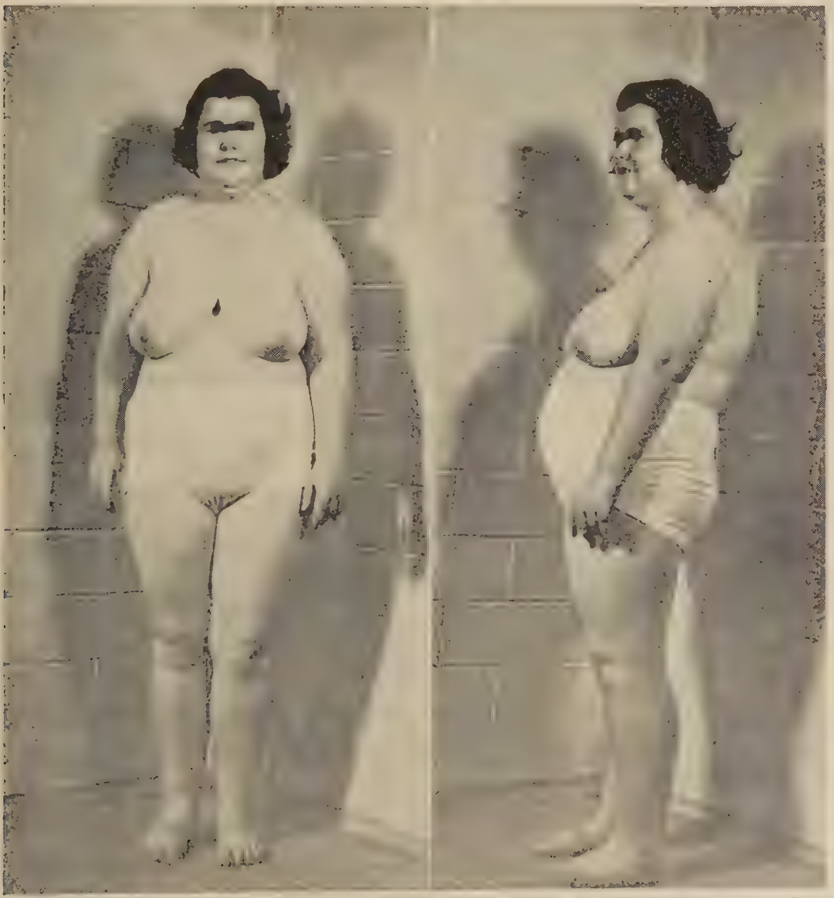


FIG. 3.—Laurence-Moon-Biedl Syndrome, incomplete form, associated with hepato-splenomegalic pancytopenia and congenital cardiac defect.

obesity and over a period of nine months (September, 1956 to May, 1957) she had lost over thirty pounds in weight. The patient complains of frequent headaches which are generalized in nature. She has been partially blind since early childhood requiring someone else to guide her.

She is the youngest of the seven siblings and had the usual childhood diseases without any serious consequences.

Ever since she had to leave school, she had stayed at home helping with some of the domestic chores like bed making, ironing, etc.

The physical examination of the patient who is a nervous, mentally defective, (I.Q. 52) almost blind and obese girl, weighing 260 pounds and standing 5 feet 4 inches in her stocking feet, reveals the incomplete form of the Laurence-Moon-Biedl syndrome complicated by a congenital cardiac condition and an enlarged spleen and liver. She is phlegmatic and slow in her movements and has to be repeatedly prompted and assisted during the examination. Her skin is clear except for a large number of pigmented nevi and small scars on her thighs. There also is a fair amount of seborrhoea. The conjunctivae and sclerae are clear, the pupils round, regular and reactive and the eyes show sweeping movements. The fundi reveal pale discs with indistinct margins and the vessels are narrowed throughout. Scattered through the fundi are small deposits of dark pigment involving the retinae primarily. There are numerous larger white areas which involve the retinae and choroid layers. The macular areas are poorly defined with increased pigment about the periphery. The ears, nose, throat, larynx and pharynx are negative. Chest examination is normal and the lungs are clear to percussion and auscultation. The cardiac outline is normal and the pulse beats at a steady regular rhythm at the rate of 84. There is a pronounced systolic, aortic murmur best auscultated along the right sternal border between the second and third intercostal spaces, which is transmitted to the side of the neck being palpable as a distinct thrill. The liver is enlarged, firm and palpable about 3 cm. below the right costal margin. The spleen is slightly tender, firm and palpable two handbreadths below the left costal margin. The pelvic examination is essentially negative. The central nervous system appears normal.

Laboratory investigations reveal a negative routine serological test for syphilis. Haematocrit is 31 to 36 per cent., the corrected sedimentation rate 6 mm., haemoglobin 11·5 gm. per cent. and the white blood cells 2,150 with 10 metas, 60 polys, 28 lymphs and 2 monos. Platelet count is 47·000 and the reticulocyte count 0·9 per cent. Urinalysis reveals a specific gravity of 1·003 to 1·015, otherwise findings negative. Stool benzidine positive on admission, negative thereafter. Fasting blood sugar 90 mg. per cent., CO_2 combining power 26 m Eq/L, chloride 112, sodium 143, potassium 3·6 m Eq/L, total protein 6 gm. per cent. with 3·2 gm. per cent. albumin, one minute bilirubin 0·6 mg. per cent., total 3·6 gm. per cent. BSP (Bromsulfalein) 23·6 retension after 45 minutes, cephalin flocculation 3 plus in 48 hours, alkaline phosphatase 3·5 units. C reactive protein negative. Prothrombin time 17·8 seconds for patient, 14·4 seconds for control, equals 33 per cent. Tourniquet test is positive. Coomb's direct and indirect test for R.H. sensitization of erythrocytes is negative. PSP (phenolsulphonephthalein) in 20 minutes 20 per cent. excretion, total over two hours 50 per cent. excreted. Venous pressure 110 mm. saline. Circulation time with magnesium sulphate 12 seconds. Chest X-ray shows elongated, transverse diameter of the heart but this is produced by expiratory position of the diaphragm. X-rays of the skull reveal numerous dental defects. X-rays of hands and feet show normally appearing bones. E.C.G. is slightly abnormal due to depressed ST segments in the precordial leads. Bone marrow examination is relatively normal with a sufficient number of megakaryocytes to suggest a thrombocytopenia to be the result of a peripheral obstruction rather than an aplasia. Gaucher's cells are absent.

Conclusions

Consultation with eye clinic suggests that fundal changes are consistent with Laurence-Moon-Biedl syndrome. A visual aid would be of no corrective use to this patient. The biochemical department agrees with the diagnosis of this syndrome and the consulting cardiologist is of the opinion that the murmur is probably due to a subaortic stenosis which is often observed in persons with the Laurence-Moon-Biedl condition. The haematologist states that the patient has multiple deficiencies in her clotting mechanism associated with a hepato-splenomegalic pancytopenia secondary to hypersplenism. Consulting surgeon advises splenectomy.

Clinical findings: Obesity, hypogonadism, oligophrenia, retinitis pigmentosa, congenital cardiac lesion and hepato-splenomegaly.

Final diagnosis: Laurence-Moon-Biedl Syndrome associated with hepato-splenomegalic pancytopenia.

SUMMARY

There were seven children born to this family, four of whom show the signs of the Laurence-Moon-Biedl Syndrome. Two siblings died as infants aged 5 and 11 months and the other two are alive. One boy aged 28 is a patient at Caswell Training School, and the other, a girl aged 22, lives with her parents.

REFERENCES

BURN, R. A., *Brit. J. Ophthalm.*, 1950, **34**, February.

COCKAYNE, E. A., KRESTIN, D., and SORSBY, A., *Quart. J. Med.*, 1935, **4**, 93.

SORSBY, A., AVERY, H., and COCKAYNE, E. A., *ibid.*, 1939, **8**, 51.

TODD, J., "A case of Laurence-Moon-Biedl Syndrome with paranoid psychosis", *A.N.M.D.*, 1955, **60**, No. 2.

TREDGOLD, R. F., and SODDY, K., *Tredgold's Mental Deficiency*, 1956 (9th edit.).

THE INCIDENCE OF CUTIS VERTICIS GYRATA IN THREE LOW-GRADE MENTAL DEFECTIVES

By

FREDERICK E. KRATTER, B.Soc.Sc., M.B., Ch.B., D.P.M.

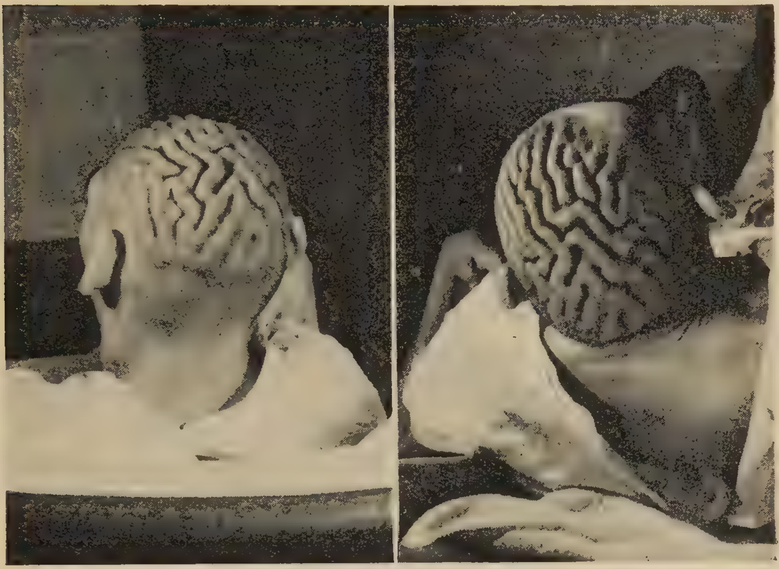
Lecturer in Mental Deficiency
University of North Carolina

THE earliest case of cutis verticis gyrata reported in the literature appears to have been that of Robert (1) in 1843. The following instances were observed by Auvert (2) in 1854 and subsequent cases were noted by Poggi (3) in 1884 and Lombroso (4) in 1890. In 1893, McDowall (5) and Cowan (6) recorded the first occurrence of this abnormal scalp development in association with a microcephalic mental defective, and since that case report several other authors such as Möller (7) in 1903 and Judassohn (8) in 1906, described similar instances. In 1907, Unna (9) presented three cases and coined the name cutis verticis gyrata. It is also known under additional terms such as "corrugated skin", "bulldog scalp" and "pachydermie occipitale vorticillée".

The cases cited in the literature were classified aetiologically by Polan and Butterworth (10) under the terminology of idiopathic and secondary types, the idiopathic types being attributed to simple hypertrophy, to developmental anomaly and to a reversion to a lower form of life, the secondary types being ascribed to pathological conditions such as inflammatory changes, naevi, tumours and various other miscellaneous diseases leading to the hypertrophy of the scalp tissues, e.g. myxoedema, cretinism, leukaemia, acromegaly, syphilis, and tuberous sclerosis. Since 1956, some three hundred cases of "bulldog skin" have been reported in the world literature.

The first case presented is that of a microcephalic, diplegic male functioning on a severely low-grade defective level (I.Q. 6) who has been at Caswell Training School for about sixteen years. He is a white patient aged 26 years in whose paternal family history a case of psychosis (grandmother) had been recorded. Otherwise no history of mental defect, epilepsy or cutis verticis gyrata was noted.

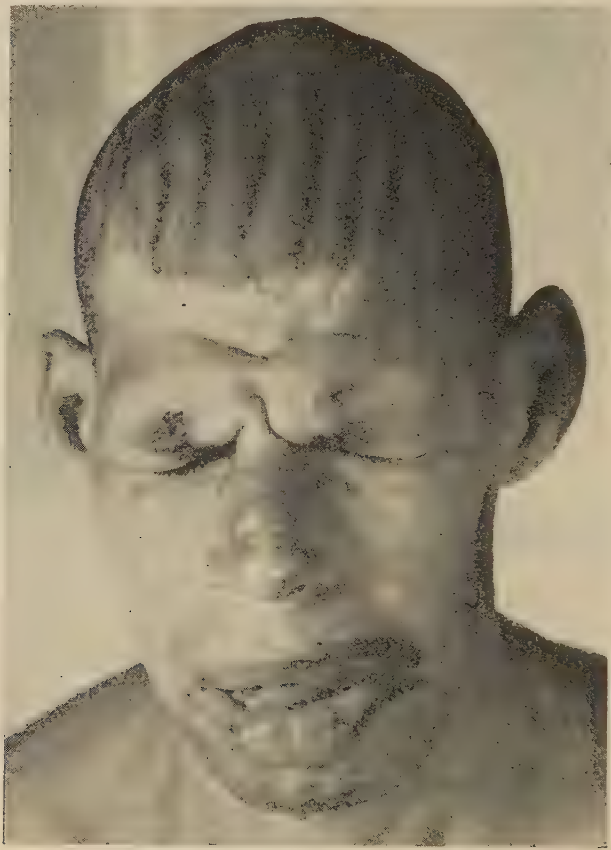
He is a poorly nourished, completely helpless, spastic, diplegic microcephalic idiot, without the power of speech and in appearance almost simian with pronounced supraorbital ridges, low, narrow receding forehead and backward-bent neck. The hair is black and of fine texture. There are eleven furrows in the scalp, antero-posteriorly arranged, averaging 3 mm. in width and 3 to 4 mm. in depth, separated by folds that range from 6 to 14 mm. in width. The folds and furrows near the midline are more pronounced than those laterally placed and they adhere to one another and are incapable of being smoothed out by traction on the scalp. In addition to these irregularities, there are others running obliquely over the higher portions of the occipital and parietal parts of the head. Over the vertex these abnormalities are most conspicuous. The whole scalp acquires a convolutional, cerebriform appearance, in which the folds and furrows of the scalp resemble the gyri and sulci of the brain surface.

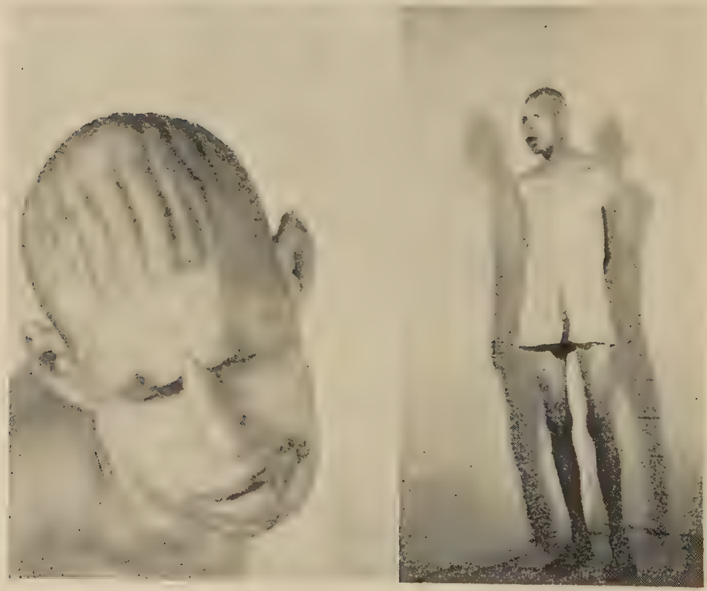


Case I

The second case is that of a white microcephalic patient aged 23 who is severely defective (I.Q. 5). He is poorly developed, thin and of small stature. He stands about the ward most of the day, is without speech, requiring toilet and feeding care. His cranial circumference is 16 inches, his hair dark and fine and at birth he weighed 4½ pounds. There is a negative family history regarding the incidence of psychosis, mental defect, epilepsy or "bulldog skin".

Beginning near the vertex and extending anteriorly over the frontal area are nine furrows in the scalp, each about 2 mm. in depth and 2 to 3 mm. in

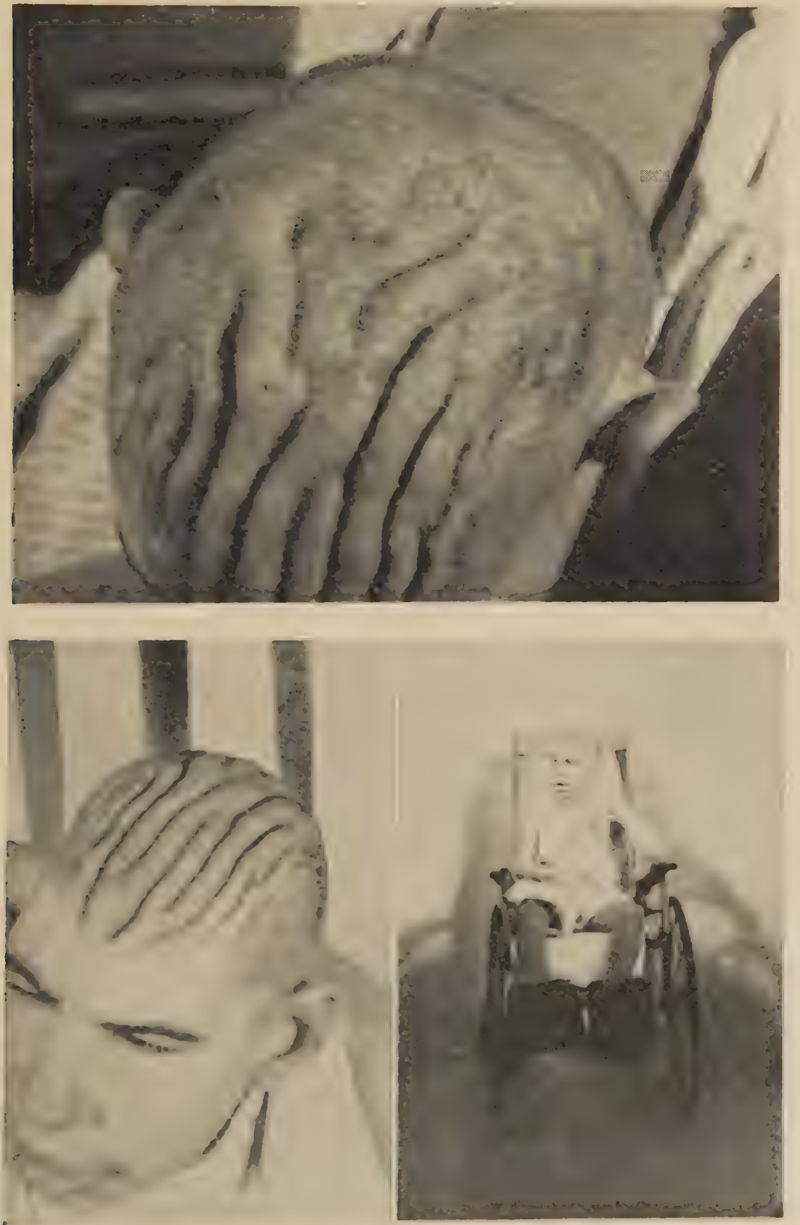




Case II

width, separated from each other by eight folds 8 to 13 mm. wide. The scalp is not movable over the underlying surface. The temporal, parietal and occipital scalp areas are not involved.

The third case is that of a white microcephalic patient aged 21. He is a spastic, diplegic cripple with multiple contractures who is severely defective (I.Q. 5) and in need of nursing care, and supervision. His cranial circumference is 15 inches, and at birth he weighed 9 pounds. At times he becomes very noisy and destructive requiring restraint and sedation. There is a negative family history.



Case III

Over the frontal area extending to the vertex, there are eight ribbon-like bands each varying in width from 6 to 12 mm., separated by nine furrows 2 mm. wide and 4 mm. in height, commencing almost from the anterior hairline of the forehead. The scalp over the occipital and parietal regions is normal.

SUMMARY

Three cases of cutis verticis gyrata are described in 3 severely defective, microcephalic males, two of whom have associated spastic, diplegic complications and contractures.

REFERENCES

1. ROBERT, A., *Journal de Chirurgie, Paris*, 1843, **1,** 125–126.
2. AUVERT, A., *Clinica et Iconographia medico-chirurgica, Paris*, 1848, tab. VII. (Abstract in Bruns, Victor, *Handbuch der Praktischen Chirurgie für Arzte und Wundärzte, Tübingen*, 1854, part 1, pp. 91–92.)
3. POGGI, —., "Ipertrofia del cuoio capelluto in una alienata", *Arch. Psichiat.*, 1884, **5,** 323–324 (translation in *J. Ment. Sci.*, 1893, **39,** 226–228).
4. LOMBROSO, —., "Rhuge anomale speciali ai criminali", *Arch. Psichiat.*, 1890, **11,** 96.
5. MCDOWALL, T. W., "Case of abnormal development of the scalp", *J. Ment. Sci.*, 1893, **39,** 62–64.
6. COWAN, J. J., "Two cases of abnormal development of the scalp", *J. Ment. Sci.*, 1893, **39,** 539–543.
7. MÖLLER, M., "Naevus giganteus capillitii im Vergleich mit einigen anderen Geschwulstbildungen der behaarten Kopfhaut", *Arch. Derm. Syph., Wien*, 1903, **64,** 197–212.
8. JUDASSOHN, J., "Eine eigentümliche Furchung, Erweiterung und Verdickung der Haut am Hinterkopf", *Verh. dtsch. derm. Ges.*, 1906, **9,** 451–453.
9. UNNA, P. G., "Cutis Verticis Gyrata", *Mh. prakt. Derm.*, 1907, **45,** 227–233 (September).
10. POLAN, S., and BUTTERWORTH, T., "Cutis Verticis Gyrata", *Amer. J. Ment. Defic.*, 1953, **57,** No. 4, 613–631.

ASSESSING A NEW PHENOTHIAZINE

By

A. A. BAKER, M.D., D.P.M.
Deputy Physician Superintendent

and

J. G. THORPE, Ph.D.
Research Psychologist
Banstead Hospital, Sutton, Surrey

INTRODUCTION

7044 IS a new phenothiazine derivative which can be regarded, pharmacologically, as resembling chlorpromazine much more closely than it does promethazine. It is said to have the characteristic central properties of chlorpromazine more highly developed, and in addition anti-adrenaline properties with anti-histamine properties comparable to those of promethazine. On a theoretical basis it might have the clinical indications of chlorpromazine.

The present report compares the efficiency of this new compound with that of chlorpromazine (Largactil) in the treatment of deteriorated female schizophrenic patients.

METHOD

(a) *Patients*

Twenty-eight deteriorated schizophrenic female patients, whose ages ranged from 35 to 55 years, who had relapsed following the termination of chlorpromazine therapy, were selected for the project. Of these, ten patients were from a ward where the nursing staff preferred habit training to drug therapy, ten from a ward where drug therapy was preferred, and the remaining eight from a third ward where no strong preference was apparent. These wards were chosen to exclude the effects of the nurses' attitudes which should otherwise be taken into account in evaluating the results (see Baker and Thorpe, 1957). Within each ward half the selected patients were treated with chlorpromazine, and half with 7044 R.P.

(b) *Treatments*

Whether each patient was to be treated with 7044 R.P., or chlorpromazine was decided by a random selection procedure and only the hospital pharmacist knew the identity of the tablets which were identical in size, colour, shape and smell, and similar in taste and texture.

With regard to dosage, for the purpose of this project, it was assumed that chlorpromazine was being prescribed for all the twenty-eight patients, and dosages were determined accordingly. Patients were under the constant supervision of the ward sisters and were seen weekly by one of the authors (A.A.B.) when dosages were adjusted according to the clinical picture presented by each patient.

(c) *Behaviour Ratings*

The Behaviour Rating Scale (Baker and Thorpe, 1956), was used in this investigation. All patients were rated on this scale at the following times:

(i) During the previous course of chlorpromazine therapy.
(ii) During relapse after chlorpromazine was stopped.
(iii) After eight weeks therapy with 7044 R.P. or chlorpromazine.
(iv) After a further twelve weeks of therapy.

When ratings (iii) and (iv) were made, a note was kept of the drug dosage in use at the time.

RESULTS

As was pointed out in our earlier article, the Behaviour Rating Scale can be regarded as having two components, first a general factor of schizophrenic deterioration and second a factor of restlessness.

During the investigation, two of the patients receiving 7044 R.P. had to be taken off the drug for reasons which will be discussed later. Among the chlorpromazine patients the drug had to be discontinued in only one case, so a second chlorpromazine patient was also omitted from the scheme, in order to even up the numbers and facilitate the statistical analysis. This patient was chosen on a random basis. Final figures are therefore based upon twelve patients receiving 7044 and twelve Largactil.

Statistical analysis revealed no significant differences between the mean ages or the mean duration of hospitalization for these two groups, which were 50 and 15 years respectively.

The mean ratings on the two factors obtained by the groups before and during the experiment are given in Table I.

TABLE I

Mean Scores During Experiment

	1		2		3		4	
	On Largactil		On Relapse		After 8 Weeks' Treatment		After a Further 12 Weeks' Treatment	
	D*	R†	D	R	D	R	D	R
Chlorpromazine Group	8·250	1·000	15·333	3·667	10·416	1·154	6·250	·750
7044 R.P. Group	8·750	·833	13·166	2·667	8·416	·500	7·250	·500

* D=Deterioration. (Sum of all the ten ratings.)
† R=Restlessness. (Sum of the A, C and I ratings.)

The significance of the differences between these means are given in Table II where differences which are significant at the 5 per cent. level are given one star, and those significant at the 1 per cent. level two stars.

TABLE II

The Statistical Significance of the Changes in Mean Scores
("t" Test for Related Means)

		On Largactil		On Relapse		After 8 Weeks' Treatment		After a Further 12 Weeks' Treatment	
		D*	R*	D	R	D	R	D	R
On Largactil	Largactil ..	—	—	3·001†	2·540†	1·021	<1·000	1·329	<1·000
	7044 R.P. ..	—	—	3·025†	2·029†	<1·000	<1·000	1·102	<1·000
On relapse	Largactil ..					2·353†	2·293†	3·017†	2·472†
	7044 R.P. ..					2·811†	2·378†	3·163‡	2·434†
After 8 weeks' treatment	Largactil ..							2·239†	<1·000
	7044 R.P. ..							1·892	<1·000
After a further 12 weeks' treatment	Largactil ..							—	—
	7044 R.P. ..							—	—

* D = Deterioration R = Restlessness
† Significant at 5 per cent. level ‡ Significant at 1 per cent. level

Table III shows the adjusted means after eight weeks' therapy and those after a further twelve weeks' therapy. They have now been adjusted for chance differences which obtained immediately preceding the introduction of 7044/chlorpromazine therapy (Thorpe and Baker, 1956), i.e. the means appearing in columns 3 and 4 of Table I have now been adjusted to what they would have been if the corresponding means in Column 2 of the same Table had been identical. Table III also gives the statistical significance of the differences between these adjusted means.

TABLE III

Mean Scores in Columns Numbered 3 and 4 of Table I Adjusted for Chance Differences in Initial Means and Statistical Analysis

	3 After 8 Weeks' Treatment		4 After a Further 12 Weeks' Treatment	
	D*	R*	D	R
Largactil	9·995	1·068	5·498	·634
7044 R.P.	8·837	·586	8·002	·616
F ratio	1·279	·750	1·130	1·135
Statistical significance ..	NS	NS	NS	NS

* D = Deterioration R = Restlessness

The mean dosages of 7044 R.P. and chlorpromazine associated with the behaviour ratings in the above Tables are given in Table IV, together with the range of dosages. The figures in this Table refer to the number of milligrams given three times daily.

TABLE IV

Means and Ranges of Dosages in Milligrams T.D.S.

	Original Dose		After 8 Weeks' Treatment		After a Further 12 Weeks' Treatment	
	Mean	Range	Mean	Range	Mean	Range
Largactil ..	70·8	25–200	116·6	50–200	116·6	50–200
7044 R.P.	70·8	25–200	87·5	25–200	81·3	25–200

Discussion

First with regard to schizophrenic deterioration. Tables I and II between them show for both groups marked changes in deterioration scores on relapse. These changes are statistically significant. After eight weeks' treatment with either drug, the deterioration scores show improvement which is again statistically acceptable. These scores are not significantly different from those obtained when the patients were previously taking chlorpromazine. After a further twelve weeks' treatment there is further improvement in the deterioration scores of both groups, and this improvement is either statistically acceptable (Largactil) or nearly so (7044). At no point in the experiment is there a significant difference between the two group means when allowances have been made for initial chance differences as is shown in Table III.

With regard to restlessness, the picture is very similar. Patients relapsing after being taken off chlorpromazine show significant increases in their scores on restlessness, but after eight weeks' treatment with 7044 or chlorpromazine they show statistically significant improvement again. Continuation of treatment for a further twelve weeks does not, in this case, however, produce further significant improvement. As with the deterioration scores, there is no evidence in these data to suggest that one or other of the two drugs is to be preferred.

It was mentioned earlier that two of the original fourteen patients being treated with 7044 had to be dropped from the project. The reason for this was that one developed a leucopenia, her white count dropping from 7,000 to 3,000 together with malaise, pallor and asthenia. The second developed a generalized erythematous rash. Only one of the chlorpromazine group had to be dropped as she was becoming increasingly lethargic and without initiative.

Although our results indicate that, in terms of deterioration and restlessness, our groups are equally responsive to 7044 or chlorpromazine, we must not lose sight of Table IV which shows that less 7044 than chlorpromazine was prescribed, although the difference was not marked. It is always possible, of course, that had we used different dosages, our results too would have been different, but it was felt that our knowledge of 7044 R.P. was too limited to allow us to predetermine the amounts which would be used.

Conclusion

In terms of our own Behaviour Rating Scale measuring schizophrenic deterioration and restlessness, 7044 and chlorpromazine are equally effective in the treatment of female deteriorated schizophrenic patients, although a slightly smaller dosage of 7044 was used. The appearance of leucopenia in one of the fourteen patients receiving 7044 suggests that additional evidence on this point is desirable.

Summary

Twenty-eight female deteriorated schizophrenic patients who had relapsed following chlorpromazine therapy were given further treatment with either chlorpromazine or 7044 R.P. Behaviour was assessed with the aid of the authors' Behaviour Rating Scale and no statistically acceptable evidence in favour of one or other of these two compounds in terms of this scale emerged. It was found, however, that slightly smaller doses of 7044 R.P. than chlorpromazine were required, and that one of the patients receiving 7044 R.P. developed leucopenia and another a skin rash.

No drug is likely to replace chlorpromazine unless it is more effective, safer or cheaper. 7044 does not appear to have any of these advantages in the case of deteriorated schizophrenic patients.

ACKNOWLEDGMENTS

We would like to thank the ward sisters who co-operated in this investigation, and Messrs. May and Baker Limited for supplying the 7044 R.P. tablets.

REFERENCES

1. BAKER, A. A., and THORPE, J. G., "Some Simple Measures of Schizophrenic Deterioration", *J. Ment. Sci.*, 1956, **102,** 838–846.
2. *Iidem*, "Placebo Response", *Arch. Neurol. Psychiat.*, 1957, **78,** 57–60.
3. THORPE, J. G., and BAKER, A. A., "A Research Method to Assess a New Tranquillizing Drug", *J. Ment. Sci.*, 1956, **102,** 790–795.

PHYSICAL TREATMENT FOR SCHIZOPHRENIA

By

A. A. BAKER, M.D., D.P.M.
Deputy Physician Superintendent

J. A. GAME
Research Psychiatric Social Worker

and

J. G. THORPE, Ph.D.
Research Psychologist
Banstead Hospital, Sutton, Surrey

Introduction and Problem

In spite of the enthusiasm with which schizophrenic patients have been treated by physical methods over the past twenty years, there is surprisingly little evidence enabling us to compare the results of one physical treatment with another, or the physical treatments themselves with the treatments they replaced. Some writers (Polonio and Slater, 1954; Rees, 1949) point out a significant improvement over the spontaneous recovery rate with the use of insulin, while others (Jensen, 1952) find no such improvement. Bourne (1953) and Notkin *et al.* (1939) go so far as to claim that any improvements of insulin-treated patients are due to the extra care and attention they receive, and the work of Ackner and his colleagues (1957) may support this conclusion. Linford Rees (1949) comparing electrical treatment with insulin concluded that electroshock therapy was far less effective than deep insulin therapy in the treatment of schizophrenia—a conclusion in line with that of Finiefs (1948). On the other hand Impastato and Almansi found very little difference between E.C.T. and insulin treatment in this respect.

Earlier this year, the present writers enquired of sixty teaching and mental hospitals in this country in order to determine which was the preferred treatment for schizophrenia. Many were unable to give answers, and there was little agreement between those who did. The majority of the teaching hospitals expressed a preference for insulin, while the mental hospitals in the main preferred E.C.T., but even so the numbers of convulsions or comas varied considerably from one hospital to another so that strict comparisons were impossible.

There are many reasons for these disagreements, but perhaps the most important of all is the lack of scientific rigour which has accompanied many researches. There have been very few studies in which two or more methods of treatment have been compared within the same hospital at the same time, and to quote Kalinowski and Hoch (1952) "as long as a comparative study of the various methods based on adequately treated material from the same hospital is not available, many questions will remain unanswered". Secondly, if two or more methods of treatment are being compared, it is essential that the treatment a patient is to receive is determined by a random selection or matching procedure, and not by the clinical judgment of the doctor in charge of the case.

The study we are now reporting is an attempt to compare the relative efficiencies of electro-convulsive, insulin coma, and Largactil therapies given to schizophrenic patients.

METHOD

(a) *Patients*

All female schizophrenic patients between 18 and 40 years of age, admitted to Banstead Hospital since January, 1956, have been included in the scheme if a team of three doctors including two consultants have been able to agree over the diagnosis of schizophrenia, and if the patient has not had previous physical treatment for that condition. As a result of this, most of our patients were either severely ill, or had a long history of illness. None had a good prognosis on all three of the common criteria—good previous personality; recent onset and retained affect. All these patients are treated on the same ward by the same doctors and nurses.

(b) *Treatments*

Three treatments have been compared. The first is a course of 20 electric convulsions given at the rate of three a week (Monday, Wednesday and Friday) for the first twelve treatments, followed by two a week (Monday and Friday) up to the eighteenth treatment, followed by one a week (Wednesday) up to twenty. The treatments are administered with a standard "Ectron" machine and the "Ectonus technique" is employed (Russell, Page and Jillett, 1953). Second is a course of 30 insulin comas given at a maximum rate of 1 coma daily for six days a week. The coma, during which the patient does not react purposefully to painful stimuli, is terminated by nasal feed after 20 minutes. Thirdly, an eight weeks' course of Largactil is given at the rate of 100 mg. three times daily. On all days except Sunday, the first 100 mg. are given intramuscularly and the second and third doses orally. All patients receive 6 grains of sodium amytal on their treatment days, the E.C.T. group some 60 minutes before the convulsions, the insulin group 45 minutes before the insulin injections, and the Largactil group 30 minutes after the Largactil injection. The Largactil patients are awakened 2½ hours after taking the amytal. The E.C.T. and insulin patients are also given 1/100 grains of subcutaneous atropine before the convulsion or coma respectively.

Clinical experience has shown that these three treatments can all produce a satisfactory remission of symptoms.

(c) *Allocation of Treatments*

Patients are allocated to one of these three treatment groups by a random selection procedure. This means that once a patient has been included in the scheme, no doctor has any say whatever in determining which treatment the patient will receive. In the event of irreversible comas, skin reactions, or other untoward effects, where to continue that particular treatment was unwise on clinical grounds, the patient has been taken out of the scheme and a more suitable treatment administered.

(d) *Testing Procedure*

Once it has been decided that a patient is in the scheme, she undergoes a battery of psychological tests immediately preceding treatment and is reassessed one week after completion of treatment. These results will be reported in a separate paper. The patient is also assessed before and after treatment on the Wittenborn rating scale (Wittenborn and Lesser, 1951), which provides ratings for psychiatric symptoms. Measures of physique, weight, and the Funkenstein Test are also recorded both before and after treatment.

(e) *Discharge*

When patients are interviewed one week after completion of treatment, the decision is made whether they can be discharged immediately, or whether further treatment or observation is needed. Patients are discharged if they are free from gross symptoms and are able to make reasonable plans for the future. The presence of personality defect, lack of insight, or affective flattening is not considered a bar to discharge. Those of our patients who are discharged would normally be considered to be recovered or much improved. Patients in whose case the treatment is considered to have failed are next given that treatment considered to be most suitable on ordinary clinical grounds.

(f) *Follow-up*

Our research psychiatric social worker follows all our patients after discharge. A patient is considered to have relapsed if she is re-admitted to hospital or if she seeks further medical help for the treatment of her symptoms.

RESULTS

Firstly, we must consider whether the groups formed in the above manner are comparable in the more important details. At the time of writing 18 patients have been allocated to the E.C.T. group, 15 to the insulin group and 15 to the Largactil group. The following Table (Table I) shows the duration of illness for those patients who completed their course of treatment, where the onset of illness is defined as the point at which overt psychotic symptoms such as hallucinations or delusions first appeared.

TABLE I

Duration of Illness

	Insulin	E.C.T.	Largactil
Less than 1 year	8	9	11
1–2 years	3	1	0
More than 2 years	1	7	3

For those patients who were discharged one week after completion of treatment, we have assessed the social environment to which they returned (Table II).

TABLE II

Social Environment After Discharge

	Insulin	E.C.T.	Largactil
Good environment	4	4	5
Medium environment	3	4	4
Bad environment	2	5	2

The more important mean scores for symptom clusters from the Wittenborn Rating Scales are given in Table III for the three groups on admission.

TABLE III

Wittenborn Scores Before Treatment

	Insulin	E.C.T.	Largactil
Paranoid schizophrenia	6·16	7·40	7·85
Schizophrenic excitement	3·91	5·30	4·50
Hebephrenic schizophrenia	2·17	4·35	3·07
Depression	4·66	5·50	4·14
Anxiety	2·75	3·53	3·65

With regard to the length of stay in hospital, the E.C.T. and Largactil groups have an average stay of just under ten weeks and the insulin group of twelve weeks.

From these figures, the Largactil group would appear to have the best prognosis in view of the greater proportion of cases whose illnesses are of less than one year's duration, and also of a slightly higher proportion of good home environments to which they were discharged. The E.C.T. group having the smallest proportion of cases of less than one year's duration, and the smallest proportion of good home environments, would appear to have the worst prognosis.

The immediate results of treatment and relapse rates are given in Table IV.

TABLE IV

Results of Treatment and Relapse Rate

	Insulin	E.C.T.	Largactil
Completed course	12	17	14
Further treatment required	3 (25%)	4 (23%)	3 (21%)
Discharged following treatment ..	9	13	11
Relapsed	5 (55%)	4 (31%)	10 (91%)

We can see from this Table that the number of cases in which the treatments were considered to have failed is about the same for all three groups and none of the differences here is significant. The same result can also be seen in the mean Wittenborn Scores following treatment. These scores are given in Table V.

TABLE V

Wittenborn Scores After Treatment

	Insulin	E.C.T.	Largactil
Paranoid schizophrenia	2·50	2·47	3·20
Schizophrenic excitement	1·92	2·06	2·00
Hebephrenic schizophrenia	1·75	1·82	1·64
Depression	2·50	2·52	2·86
Anxiety	2·08	1·47	2·14

In no case is there a statistically significant difference between the groups on any of these symptom clusters; though on all clusters all groups show improvements which are significant at beyond the 5 per cent. level when compared with the symptom scores before treatment seen in Table III. This finding fits in well with the marked clinical improvement seen in most patients following treatment irrespective of which treatment they have had.

The statistical significance of the differences between the relapse rates shown in Table IV are as follows:

Between Insulin and E.C.T. : Not significant ($\cdot 3 > p > \cdot 2$)
Between Insulin and Largactil : Significant ($p = \cdot 05$)
Between E.C.T. and Largactil : Significant ($\cdot 05 > p > \cdot 01$)

Thus the relapse rate for the Largactil group is significantly higher than for the other two groups in spite of the fact that it was favourably placed in respect of prognostic factors initially. What is also important is that the E.C.T. group have done slightly better than the insulin group in spite of the poorer initial prognosis, though the difference between them does not reach statistical significance.

In this study as in many others, there is striking evidence of the importance of early treatment for this type of patient. For the combined E.C.T. and insulin groups, 60 per cent. of those patients in whom overt psychotic symptoms such as hallucinations or delusions had appeared within one year preceding treatment have been successfully treated and have not returned to hospital, nor are they showing any signs of relapse. For those patients whose illness could be dated back beyond one year, only 40 per cent. are so situated.

CONCLUSIONS

The present study, in spite of the small number of patients with which it is so far concerned, has already provided sufficient evidence against the use of Largactil in the manner described, to compel us to change the treatment policy for this group of patients.

At present, the evidence on the relative efficiencies of E.C.T. and insulin points conclusively in neither direction though there is some evidence slightly in favour of E.C.T. The study will probably have to continue for some years before any definitive conclusions can be reached with regard to these two treatments.

SUMMARY

By a random selection procedure, schizophrenic female patients were divided into three groups and treated by E.C.T., Insulin and Largactil respectively. Preliminary results indicate that there are no significant differences between treatments immediately following treatment, all groups showing significant improvement. The relapse rate for the Largactil group, however, is significantly higher than the relapse rate for the E.C.T., or for the Insulin groups. No significant difference has yet emerged between the E.C.T. and Insulin treatments.

ACKNOWLEDGMENTS

The help of Drs. E. Caldwell and E. D. Myers, who have done so much of the work on the ward, is gratefully acknowledged. Thanks are also due to the South-West Metropolitan Regional Board for their research grants, and to Dr. E. P. H. Charlton, Physician Superintendent, Banstead Hospital, for permission to publish these results.

REFERENCES

1. ACKNER, B., HARRIS, A., and OLDHAM, A. J., *Lancet*, 1957, *i*, 607.
2. BOURNE, H., *Lancet*, 1953, **265**, 964.
3. FINIEFS, L. A., *J. Ment. Sci.*, 1948, **94**, 575.
4. IMPASTATO, D. J., and ALMANSI, R., *J. Nerv. Ment. Dis.*, 1942, **95**, 395.
5. JENSEN, E., *Acta Psychiat. Kbh.*, 1952, **80**, Suppl. 28–129.
6. KALINOWSKI, L. B., and HOCH, P. H., *Shock Treatments, Psychosurgery, and other Somatic Treatments in Psychiatry.*
7. NOTKIN, J., MILES, G. R., DE NATALE, F. J., and WITTMAN, G., *Amer. J. Psychiat.*, 1939, **96**, 681.
8. POLONIO, P., and SLATER, E., *J. Ment. Sci.*, 1954, **100**, 442.
9. REES, L., *ibid.*, 1949, **95**, 625.
10. RUSSELL, R. J., PAGE, L. G. M., and JILLETT, R. L., *Lancet*, 1953, *i*, 1177.
11. WITTENBORN, J. R., and LESSER, G. S., *J. Clin. Psychol.*, 1951, **7**, 317.

THE EFFECTS OF PHYSICAL TREATMENT ON SOME PSYCHOLOGICAL FUNCTIONS

By

J. G. THORPE, Ph.D.
Research Psychologist

and

A. A. BAKER, M.D., D.P.M.
Deputy Physician Superintendent
Banstead Hospital, Sutton, Surrey

PROBLEM

It is not only the directly observable therapeutic effects of treatment which will determine the value of that treatment—in many cases the accompanying side effects are equally, if not more important, depending upon their nature and severity.

It has frequently been claimed that electro-convulsive therapy disrupts the patient's intellectual functioning, and some would go on to say that the disruption is so severe that the patient's symptoms are lost in the confusion and disorientation following this treatment.

Studies which have already appeared in the literature are by no means unanimous in their conclusions, although there seems to be reasonable agreement that impairments of memory and of other psychological functions follow electro-convulsive treatment (Delay and Binois, 1944; Worchel and Narciso, 1950; Stone, 1946; Luborski, 1948; Fleck and Gantt, 1951).

The majority of investigators also agree that this impairment is of a temporary nature only (Zubin and Barrera, 1941; Delay and Binois, 1944; Stone, 1946; Luborski, 1948), although there is some evidence that defects in memory for material of a personal nature is comparatively long lasting (Janis, 1950).

Disturbances of intellectual functioning are rarely claimed to be sequelae of insulin and drug therapies, and there is no doubt that the reason for this is that such sequelae are rarely seen clinically. There is, however, surprisingly little evidence enabling comparisons of the psychological changes following these treatments to be made.

We have shown elsewhere (Baker, Game and Thorpe, 1958) that female acute schizophrenics, who have previously had no physical treatment for their schizophrenia, are greatly improved after some ten weeks in hospital, no matter whether they have had a course of 20 E.C.T.s; 30 insulin comas; or an 8 week's course of chlorpromazine, although the last group showed a significantly higher relapse rate.

The investigation we are about to report is concerned with the effects of these three treatments on intelligence, on learning, on attention and on memory.

METHOD

(*i*) SUBJECTS

Twenty-seven of the schizophrenic patients described in detail in our above paper were tested one day prior to treatment and on the seventh day after the last treatment. On the basis of random selection, nine of the patients had 20 E.C.T.s; nine had 30 insulin comas; and the remaining nine had an eight weeks' course of chlorpromazine. Full details of these methods of treatment appear in the paper cited above.

(*ii*) TESTS (given in the following order)

A. *Intelligence*

(a) The Progressive Matrices (Raven, 1948a).

(b) The Mill Hill (Raven, 1948b) (synonym version).

B. *Learning Ability*

(c) *Learning Nonsense Syllables.* A list of ten three-letter nonsense syllables was presented, one syllable at a time in an improvised memory drum. The patient had to read the syllables out loud and to try to anticipate them at the second and subsequent presentations. Seven presentations, including the initial one, were made. This gave a maximum possible score of 60—one point for each syllable correctly anticipated. All the patients had the same list of syllables before treatment began, and the same after treatment. The two lists were, of course, different.

(d) *Learning Numbers.* Exactly the same procedure was adopted, this time using random single digit numbers instead of syllables. Again a maximum score of 60 was possible, and a different set of numbers was used after treatment.

(e) *Learning Geometrical Shapes.* A foolscap sheet of paper on which were drawn six shapes was presented for two seconds only. The patient had to draw as many of the shapes as she could remember; her drawing was then removed, the shapes presented again for another two seconds, and so on. Seven presentations were made and hence a maximum score of 36 was possible. A different set of shapes was used in the post-treatment session.

C. *Attention*

(f) *Digit Span* (*forwards*). The Wechsler Bellevue instructions for this test were followed carefully, but we devised our own set of digits. The patient's score was the number of digits she could successfully repeat after the examiner.

(g) *Digit Span* (*backwards*). Again following Wechsler, the number of syllables correctly reversed was counted. In the case of both forward and backward span different sets of numbers were used in the post-treatment session.

(h) *Span of Apprehension.* A set of 13 cards each $8\frac{1}{2}$ inches × 7 inches was used. Each card had drawn on it a number of dots ranging from 2 to 14 and the cards were in random order. Each card was exposed for half a second and the patient had to estimate how many dots there were on the card. The patient was credited with the highest number of dots she had correctly reported before a failure. The test was repeated with the cards inverted and a second score obtained. The final score was the average of the two.

D. *Memory*

(i) *Syllables remembered.* The number of previously learned syllables the patient was able to anticipate correctly at one trial was counted.

(j) *Numbers remembered.* Same as for syllables.

(k) *Shapes remembered.* Same as for syllables.

(*iii*) TESTING PROCEDURE

Testing was carried out in the Ward Clinic in conjunction with the testing programme outlined elsewhere (Thorpe and Baker, 1958). Care was taken that no patient had received any drugs on the day of testing.

RESULTS

The mean scores obtained by the three groups of patients before and after treatment are given in Table I.

TABLE I

		Pre-Treatment	Post-Treatment
(*a*) Progressive matrices I.Q.	E.C.T.	76·479	86·136
	Insulin	77·811	96·792
	Largactil	83·028	93·351
(*b*) Mill Hill I.Q.	E.C.T.	80·919	83·139
	Insulin	87·024	93·684
	Largactil	90·465	96·570
(*c*) Learning syllables	E.C.T.	10·656	19·570
	Insulin	20·313	31·857
	Largactil	15·984	24·309
(*d*) Learning numbers	E.C.T.	28·527	37·296
	Insulin	39·516	44·511
	Largactil	42·402	37·851
(*e*) Learning shapes	E.C.T.	18·111	24·000
	Insulin	27·667	32·333
	Largactil	28·333	29·667
(*f*) Digit span-forwards	E.C.T.	5·667	5·667
	Insulin	5·556	6·000
	Largactil	5·556	6·111
(*g*) Digit span-backwards	E.C.T.	3·778	4·111
	Insulin	3·778	4·333
	Largactil	4·000	4·000
(*h*) Span of apprehension	E.C.T.	8·222	7·556
	Insulin	7·889	8·556
	Largactil	7·556	8·000
(*i*) Syllables remembered	E.C.T.	2·333	4·222
	Insulin	3·667	5·222
	Largactil	2·889	5·222
(*j*) Numbers remembered	E.C.T.	6·000	7·333
	Insulin	6·222	8·444
	Largactil	7·444	6·555
(*k*) Shapes remembered	E.C.T.	4·222	5·333
	Insulin	5·111	6·222
	Largactil	5·333	6·444

The means following treatment were then adjusted for chance differences in pre-treatment means by the use of analysis of covariance in order to increase the precision of the experiment. These adjusted means are given in Table II together with the statistical significance of the differences between them. In this Table the mean scores for syllables, numbers and shapes remembered have been *doubly* adjusted, first for chance differences in memory scores before treatment, and second for learning scores after treatment. This second adjustment has been made because of the obvious relation between number learned and number remembered.

TABLE II

	E.C.T.	Insulin	Largactil	F. ratio
Matrices	87·712	97·569	90·997	<1
Mill Hill	87·313	92·974	93·107	<1
Learning syllables	23·128	28·424	24·075	<1
Learning numbers ..	40·401	43·517	35·780	<1
Learning shapes	27·903	30·579	27·519	<1
Digit span-forwards ..	5·614	6·026	6·137	<1
Digit span-backwards ..	4·138	4·360	3·946	<1
Span of apprehension ..	7·366	8·556	8·189	<1
Syllables remembered ..	5·778	3·452	5·445	<1
Numbers remembered ..	8·116	8·644	5·522	<1
Shapes remembered ..	6·549	6·150	5·300	<1

None of the F ratios is significant.

DISCUSSION

To begin with Table I, our data indicate that nearly all the psychological aptitudes which have been tested show improvement after treatment. The patients who have received E.C.T. show improvement on nine out of the eleven tests, those who received insulin improved on all the eleven tests, and the Largactil patients improved on eight of them. It is not possible to test the significance of these results as the tests are not, strictly speaking, independent of one another. The figures do permit the general conclusion, however, that some improvement in the psychological functions of intelligence, learning ability, attention, and of memory does appear to follow the three physical treatments in question.

We do not consider that these improvements are due entirely to practice effects, on the grounds that most of the test material which was presented after treatment was different from that presented before treatment. Further, on the two intelligence tests which were presented on both occasions, the Matrices I.Q. increased from 79 to 92 (i.e. 13 I.Q. points) and the Mill Hill I.Q. from 86 to 91 (5 I.Q. points). These improvements are far larger than could reasonably be accounted for by practice.

With regard to Table II, in no case is there a significant difference in the scores following treatment. Taking any of the eleven tests, our data do not provide evidence that the patients who have received E.C.T. are at a disadvantage when compared with the other treatment groups. It is possible, of course, that with much larger numbers of patients, significant differences would emerge, but these differences would probably be only slight, as our data suggest. Looking at this Table as a whole, we find that the insulin patients following treatment are superior to the other two in seven of the eleven tests, as compared with superiority in four tests equally shared by the E.C.T. and

Largactil patients. As before, we cannot apply a statistical test to these data as the tests are probably not independent.

The present results are perhaps surprising if viewed in the light of the studies mentioned earlier which were concerned in the main with far fewer electric shocks than in the present study, and which provided strong evidence that the effect of E.C.T.s was cumulative. Our results show that as many as 20 E.C.T.s given as described do not disrupt psychological functioning as greatly as many studies suggest.

One final point with regard to Table I. It should be remembered that these improvements are improvements in test performance immediately preceding treatment, i.e. at a time when the schizophrenic symptoms were probably at their worst. The effects of the three treatments on psychological aptitudes before the onset of the schizophrenic symptoms cannot be shown from our data.

CONCLUSIONS

The present study provides no conclusive evidence that schizophrenic patients who have received a course of 20 E.C.T.s are inferior on tests of learning, of immediate memory, and of intelligence one week after completion of treatment, if they are compared with similar patients treated by insulin coma or chlorpromazine therapies.

ACKNOWLEDGMENTS

We wish to thank Dr. Charlton for allowing us to publish these data.

REFERENCES

1. BAKER, A. A., GAME, J. A., and THORPE, J. G., "Physical Treatment for Schizophrenia", *J. Ment. Sci.*, 1958, **104**, 860.
2. DELAY, J., and BINOIS, R., "Etude Expérimentale de la mémoire et de l'attention des électro-chocs (1)", *Ann. méd. Psychol.*, 1944, **102,** 182.
3. FLECK, S., and GANTT, W. H., "Conditional responses in patients receiving E.C.T.", *Amer. J. Psychiat.*, 1951, **108,** 280.
4. JANIS, I. L., "Psychologic effects of electric convulsive treatments", *J. Nerv. Ment. Dis.*, 1950, **3,** 359.
5. LUBORSKY, L. B., "Psychometric changes during E.C.T.", *ibid.*, 1948, **107,** 531.
6. RAVEN, J. C., *Guide to Using Progressive Matrices*, 1948a. London: H. K. Lewis & Co., Ltd.
7. *Idem, Guide to Using the Mill Hill Vocabulary Scale with Progressive Matrices*, 1948b. London: H. K. Lewis & Co., Ltd.
8. STONE, C. P., "Characteristic losses and gains in scores on the Wechsler Memory Scales as applied on psychotic patients before, during, and after a series of electro-convulsive shocks", *Ann. Psychologist*, 1946, **1,** 245.
9. THORPE, J. G., and BAKER, A. A., "Dimensional theory applied to schizophrenic patients", *J. Ment. Sci.*, 1958, **104**.
10. WORCHEL, P., and NARCISO, J. C., JR., "E.S.C.s and memory; the interval between learning and shock", *J. abnorm. soc. Psychol.*, 1950, **45,** 85.
11. ZUBIN, J., and BARRERA, S. E., "Effect of electro-convulsive therapy on memory", *Proc. Soc. Exper. Biol. and Med.*, 1941, **48,** 596.

MC4703*
A NEW PHENOTHIAZINE DERIVATIVE

By

J. G. HEGARTY, M.B., B.Ch., D.P.M.
Oakwood Hospital, Maidstone, Kent

MC4703 is a new phenothiazine derivative which contains a trifluoromethyl group and which was made available in the form of 10 mg. and 50 mg. tablets by E. R. Squibb & Sons for clinical evaluation as an ataractic or "tranquillizing" agent. The interesting results obtained with the drug justify the presentation of this brief, preliminary report, but a more detailed account of the investigation will be supplied in due course.

Selection of Cases

The drug was given to 153 patients of whom 118 were schizophrenic and 35 psychotic or psycho-neurotic non-schizophrenics. Within the schizophrenic group, the average age was 45 years and the average stay in hospital was 10 years. Eighteen typical paranoid and 15 simple schizophrenics were included, but the other patients in this group were mainly very restless, hallucinated schizophrenics of various diagnostic categories. Almost all the patients were selected from the refractory wards and were restless, deluded, hallucinated, troublesome, violent, unoccupiable, or difficult to manage.

The mixed group consisted of 2 alcoholic patients, one drug addict, 2 manics, 2 patients with Huntington's chorea, one case of congenital G.P.I., 10 depressives, 6 mental defectives, 4 epileptic patients with psychosis and a balance of patients with pre-senile and senile dementias. The control group was made up of 50 schizophrenics and 25 patients with mixed psychoses.

Dosage and Method of Evaluation

The trial occupied 7 months and many of the patients were treated with MC4703 for 6 months. At the beginning of the investigation, doses of 50 mg. were given 3 times daily as routine, but as experience was gained the initial dose was lowered to 15 to 25 mg. twice or thrice daily with subsequent increase up to 100 mg. t.d.s. if required. The highest dose given was 150 mg. 3 times daily. Each case was scored on a scale of points before and after treatment with the drug, and evaluation was based on changes observed in the total score of each individual. This method will be described in greater detail in a subsequent communication.

Results

Within the schizophrenic group the improvement of 36 patients (31 per cent.) was rated as "very good". Six of these had shown only limited improvement after insulin treatment, but responded well to MC4703, 5 being discharged and the other receiving continued treatment as an out-patient. Sixteen others made good social recoveries and 9 of them have been discharged, while the rest have been re-graded to voluntary status and are fit for discharge. The remainder are now fully occupied, are industrious and show few symptoms of psychiatric importance. Twenty patients (17 per cent.) are regarded as showing "good" improvement and they have become industrious, co-operative and friendly; in this group there is little evidence of delusions or hallucinations. The improvement of 25 (21 per cent.) is "fair". Their work, activity and co-operation is better and they are more manageable; some have retained their delusions but these are much less intense. The remaining 37 patients (31 per cent.) failed to respond.

---

* Trade name U.S.A.—VESPRIN.

In general, the non-schizophrenic patients showed little response apart from decreased restlessness and within this group was found the highest proportion of such side effects as occurred. However, the alcoholic patients and the barbiturate addict responded well, and the drug seemed to be a very effective form of replacement therapy in these cases.

Two patients who had chronic skin ulceration due to picking and scratching and who had not responded to other "tranquillizers" or local applications showed immediate improvement on MC4703. The scratching stopped and has not recurred. Four patients prone to epileptic fits as well as showing other psychotic symptoms were also given the drug. One who had had almost daily fits had none for a week after starting to take MC4703, but then had a succession of fits. Three others who had not had fits for a long time had a single seizure shortly after starting treatment; withdrawal of their previous barbiturate therapy might have been responsible.

In certain cases beneficial effects were observed when MC4703 was given with various barbiturates. Three of the treated patients were subjected to E.C.T. without ill effect. When the drug was discontinued, as it usually was after about 3 months, the relapse rate was negligible.

SIDE EFFECTS

Routine blood examination in all cases failed to reveal any fall in white cell count. No dryness of the mouth was noted. Two patients passed white stools and urine containing elevated bile pigments, but these phenomena disappeared when treatment was stopped and there was no case of frank jaundice. Three patients developed papular rashes which disappeared promptly on withdrawing the drug. Increased frequency of urination was seen during the first few days and increased sweating was sometimes noticed. Parkinson-like symptoms with drooling, tremor and rigidity occurred in 13 cases; these symptoms disappeared when the drug was stopped. Drowsiness was quite common during the first few days but it generally passed off quickly; a few patients became rather ataxic at the start but responded favourably to a reduction in dosage. Depressive symptoms were noted in 15 cases, usually in very excited, highly hallucinated and very detached patients, who were beginning to benefit. These effects disappeared within about a week, and were regarded, on the whole, as a good prognostic sign. Hypotensive effects, represented by falls of up to 40 mm. Hg, were troublesome at the beginning of the study when a high initial daily dose of 150 mg. was given routinely. Some hypertensives showed relative hypotension soon after taking the drug until the initial dose was lowered to the levels already mentioned, and from that time pronounced falls in blood pressure have been very infrequent.

DISCUSSION

MC4703 is a powerful ataractic drug and appears to be much superior to other "tranquillizers" at present used in the treatment of schizophrenia. Improvement, when it occurred, was rapid, often being evident during the first week of treatment, but tended to continue slowly over many months. Paranoid schizophrenics responded best, but a large group of very deteriorated, hallucinated, over-active and violent patients reacted almost as well. Classification, methods of evaluating therapy and the human pharmacology of MC4703 will be discussed more fully in a later communication.

ACKNOWLEDGMENTS

I wish to express my thanks to Dr. McLaren, the Medical Superintendent of Oakwood Hospital, for having given me the facilities which have made this study possible. And I also wish to acknowledge the help and co-operation of the other medical officers and the nursing staff of this hospital.

A CLINICAL TRIAL OF STEMETIL (PROCHLORPERAZINE)

By

HUGO B. MILNE, M.B., Ch.B., Dip.Psych.(Edin.)
Senior Psychiatric Registrar
Pastures Hospital, Mickleover, Derby

and

FRITZ BERLINER, M.D.
Consultant Psychiatrist
Pastures Hospital, Mickleover, Derby

INTRODUCTION

PHENOTHIAZINE derivatives have been widely employed in the management of schizophrenia over the past few years. Possibly the most commonly used has been chlorpromazine under its trade name "Largactil".

The compound under investigation is a new phenothiazine derivative incorporating a piperazine ring in the side chain. This preparation, prochlorperazine, is marketed under the trade name of "Stemetil".

In laboratory tests this agent does not show in such close parallelism the relationship between the anti-emetic and central sedative effects of the earlier phenothiazine derivatives such as chlorpromazine. The anti-emetic effects have been studied experimentally and, recently, clinically by Smithy and Homburger (1957), the results confirming its greater anti-emetic potency compared with chlorpromazine. In view of this property prochlorperazine has been studied in cases of Ménière's syndrome and in migraine.

Ducrot and Koetschet (1956) found that Stemetil was 5–10 times less active than chlorpromazine in impairing the performance of the reflex in mice concerned with regaining their balance after being suspended from a horizontal wire.

Experimentally, it has been found to produce in rats, in a dosage of 10 mg./kg. subcutaneously, a cataleptiform state with immobility, some rigidity, and a condition resembling flexibilitas cerea. These animals can be moulded into abnormal postures which are sustained for a considerable time. (It will be seen later that comparable states have been observed in two of our patients.) Troublesome though this complication was, it was never prolonged and it cleared up rapidly.

Broussolle and Dubor (1956) investigated its action in mental disorder. The provisional results of their trial at the end of 4 months indicated that prochlorperazine is active in smaller doses than chlorpromazine. The side-effects described were those of Parkinsonism and atypical involuntary movements.

MATERIAL AND METHOD

The patients studied in this trial consisted of 50 male schizophrenics, ranging in age from 21 to 58 years.

The following table gives details of the clinical diagnosis, average duration of illness and treatments employed prior to the trial.

Diagnosis	No.	Average Duration of Illness in Years	E.C.T.	Insulin	Leucotomy	Chlorpromazine
Simple hebephrenic	20	12	16	7	2	19
Catatonic	15	9	15	10	3	14
Paranoid	15	11	11	6	—	14

As will be seen, the average duration of illness, overall, was about 11 years. Most of the patients were of the type to be found in the chronic wards of any mental hospital. Prior to the trial most of them were unemployable, liable to impulsive behaviour, and generally careless of their appearance. They were withdrawn and aloof, and took little part in the social activities of the hospital. In most of them hallucinations and delusions were prominent. Even when given parole few of them would use it. E.C.T., and deep insulin therapy had produced transient improvement only, and leucotomy had failed. Chlorpromazine in the dosage used had produced better results without, however, removing all the troublesome features.

All but 3 of the patients had had chlorpromazine with an average dose of 75 mg. t.i.d., and their response to the drug was known and charted.

The present trial could therefore be considered as a comparative study of the effects of prochlorperazine against the known effects of chlorpromazine.

Two weeks prior to the administration of prochlorperazine, chlorpromazine therapy was discontinued.

During this period, the behaviour of the patients deteriorated rapidly, thereby proving the value of chlorpromazine in certain types of chronic psychosis. The patients were probably at their worst when prochlorperazine was introduced. Each patient received 25 mg. t.i.d. of the drug orally with the exception of two acute catatonic schizophrenics who were given it intramuscularly because they were unco-operative.

Prior to treatment, routine blood counts, liver function tests (i.e. thymol turbidity and flocculation and Van den Bergh), urine analysis, basal blood pressure, body temperature and weight were noted. During the trial, pulse and temperature were recorded twice daily, blood pressure daily for the first week, and thereafter on the 2nd, 3rd, 6th, 9th, and 12th week.

The E.S.R., W.B.C., and liver function tests were repeated at similar intervals.

The weight was recorded at weekly intervals.

The nursing staff was requested to note any specific side-effects. All the patients were granted parole as soon as their condition permitted, and were encouraged to take part in occupational therapy and other social activities.

The progress or otherwise of the patients was assessed in two ways:

1. *By the Nursing Staff*

A behaviour rating chart was used similar to that described by Baker and Thorpe (1956), the principle being that the more abnormal the behaviour the greater the scoring.

The nursing staff marked each patient's behaviour daily from Monday to Friday.

The individual scores thus obtained were totalled each day and the average rating per day for the whole group was thereby ascertained.

Every week the total for each of the 12 factors of behaviour (A to N, Baker and Thorpe) was calculated, and these weekly readings were charted. The charts which follow later will make this clear.

2. *Assessment by One of Us (H.B.M.)*

During the trial all clinical observations were made by the same observer in order to standardize the assessment.

RESULTS

Within 5 weeks of treatment, the patients showed improvement comparable to that obtained with chlorpromazine, i.e. the average daily behaviour rating, which rose rapidly following the withdrawal of chlorpromazine, returned to what it had been under chlorpromazine therapy but on an average dose of 25 mg. t.i.d. of prochlorperazine, that is one-third of the chlorpromazine dosage. The patients continued to improve beyond this stage, and maximum benefit was attained by the 10th week of treatment by which time the average daily rating had fallen to half of what it had been, without any change in dosage.

Analysing the individual factors we found the most marked changes in tidiness, personal hygiene, ability and willingness to work without supervision, and facility of verbal expression. Patients who had hitherto been withdrawn, asocial, and monosyllabic, became friendly and co-operative. They began to enjoy their work and their leisure. During the first month of treatment, many patients showed marked motor restlessness and, indeed, many complained of this spontaneously, a complaint never encountered during chlorpromazine therapy. This restlessness, troublesome though it may be subjectively, has in our opinion the merit of activating the hitherto inert patients. It is merely a phase which passes into more purposeful activity and more normal affect.

Hallucinations and delusions tend, in successful cases, to go into the background or disappear altogether.

The graphs on the following pages will show clearly the results of improvement in diagrammatic form.

The overall results of this trial are very encouraging. It has to be borne in mind that the prognosis for the patients selected was bad. The most disappointing results were seen in paranoid schizophrenics. On the face of it, this would seem surprising, as the worst results with any treatment are practically always seen in simple schizophrenics and hebephrenics.

We think there are two reasons for this: firstly, many of the chronic paranoid schizophrenics in this hospital had been successfully treated, and discharged after intensive chlorpromazine therapy and those in our group were the treatment-resistant paranoids.

Secondly, prochlorperazine seems to increase drive and affect in simple schizophrenics and hebephrenics, whereas chlorpromazine does not appear to have this effect.

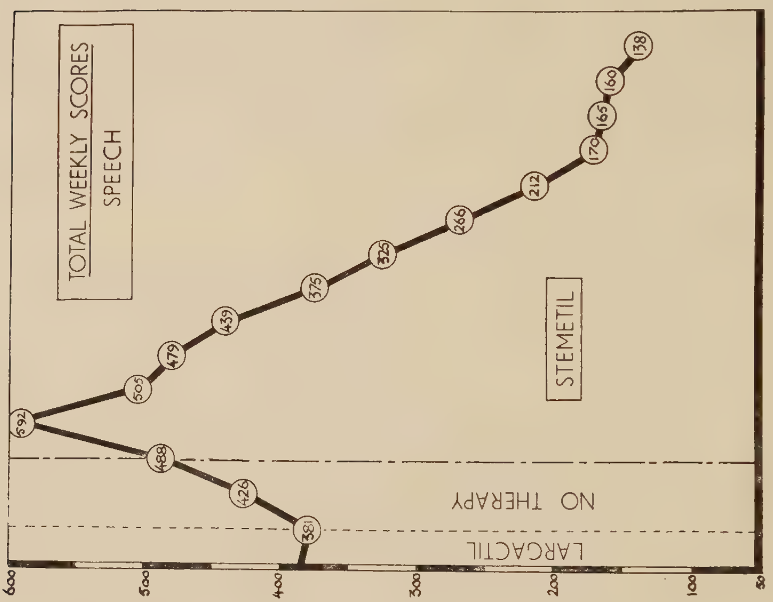

TOTAL WEEKLY SCORES
SPEECH
LARGACTIL
NO THERAPY
STEMETIL
381
426
488
592
505
479
439
375
325
266
212
170
165
160
138
600
500
400
300
200
100
50

FIG. 2.

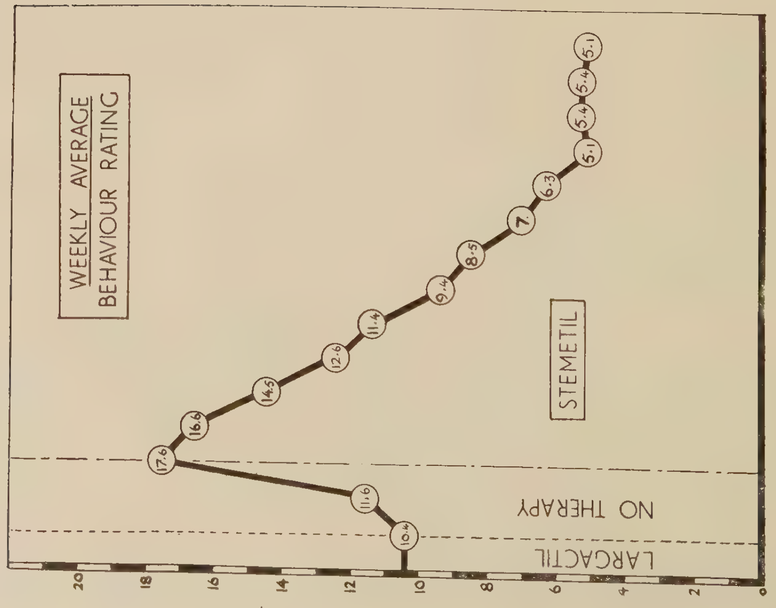

WEEKLY AVERAGE
BEHAVIOUR RATING
LARGACTIL
NO THERAPY
STEMETIL
10.4
11.6
17.6
16.6
14.5
12.6
11.4
9.4
8.5
7.
6.3
5.1
5.4
5.4
5.1
20
18
16
14
12
10
8
6
4
2
0

FIG. 1.

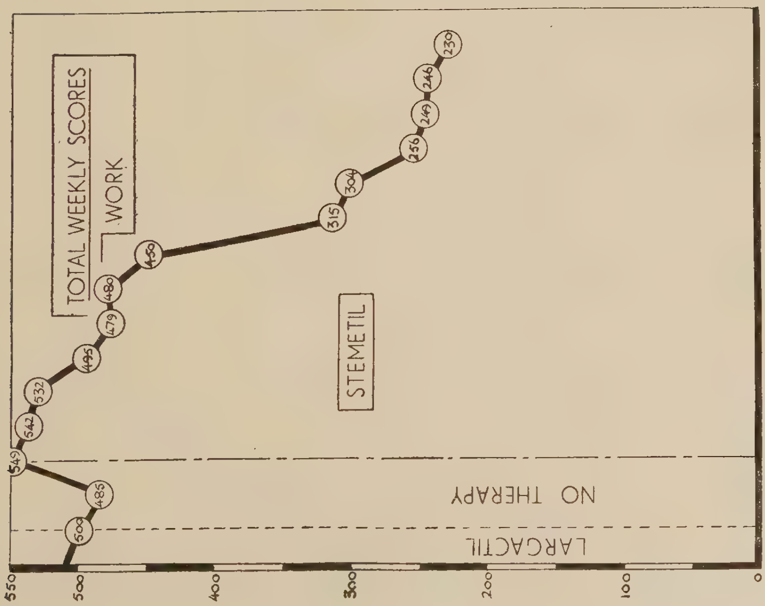

TOTAL WEEKLY SCORES
WORK
LARGACTIL
NO THERAPY
STEMETIL
500
485
549
542
532
495
479
480
450
315
304
256
249
246
230
550
500
400
300
200
100
0

Fig. 3.

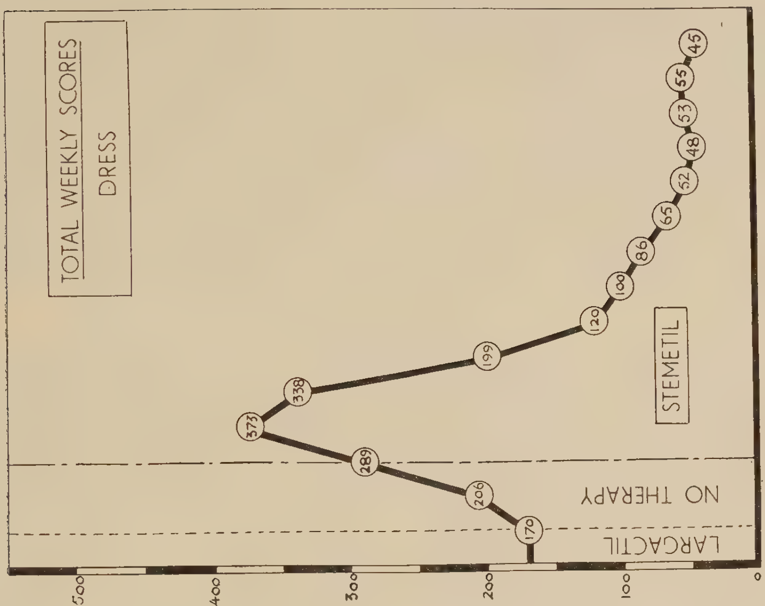

TOTAL WEEKLY SCORES
DRESS
LARGACTIL
NO THERAPY
STEMETIL
170
206
289
373
338
199
120
100
86
65
52
48
53
55
45
500
400
300
200
100
0

Fig. 4.

The following case will illustrate this:

E.K., aged 34, a married man who had been a bank clerk. One sister is a chronic schizophrenic in our hospital.

Onset of present illness in 1949. He became increasingly flattened in affect, showed thought-blocking and was manneristic, untidy, and unable to work regularly. He was frequently aggressive towards his wife and children. There was no evidence of delusions or hallucinations. He received E.C.T., deep insulin, and prolonged courses of chlorpromazine and reserpine but with transient improvement only.

Five weeks after introduction of prochlorperazine he showed normal interest and affect. He was no longer manneristic or aggressive. Two months later he was well enough to go to a Rehabilitation Centre where he stayed for 8 weeks. He is now living a normal life, and works regularly in partnership with his father in the grocery trade. He attends our Out-patient Clinic periodically and has so far shown no sign of relapse. He is taking 50 mg. of prochlorperazine t.i.d. His wife reports that he is as well as he was prior to the onset of his illness in 1949.

Table of Results

Diagnosis	No.	Discharged	Much Improved	Improved	No Improvement
Simple hebephrenic	20	5	3	8	4
Catatonic	15	5	5	4	1
Paranoid	15	3	3	5	4

SIDE-EFFECTS AND COMPLICATION

No blood dyscrasias were observed. None of the patients in this series developed jaundice. (A female patient, not in this series, developed jaundice which cleared up on withdrawal of the drug.) Ten patients in this series showed abnormal liver function on tests while under chlorpromazine therapy. Withdrawal of chlorpromazine resulted in a return to normal liver function. Under prochlorperazine their liver function tests remained normal as did those of all other patients in this series. No abnormalities were revealed by urine analysis or blood sedimentation rate. None of the patients showed photosensitization. In the early stages, all patients complained of dryness of the mouth, nasal stuffiness and some also of excessive thirst. Where the serum sodium and potassium were checked they were found to be normal. Two severe hypotensive attacks occurred within 30 minutes of oral administration of 25 mg. of the drug. Both these attacks took place within the first few days of treatment, and responded rapidly to rest; they did not necessitate withdrawal of the drug.

Five patients showed varying degrees of extrapyramidal disturbance, viz. mask-like face, cog-wheel rigidity, difficulty in walking and tremor. Temporary discontinuation of the drug abolished these side-effects. When prochlorperazine was combined with the administration of 25 mg. Phenergan t.i.d., the extrapyramidal signs did not recur. As mentioned earlier, two of our cases, both catatonics, produced a syndrome reminiscent of the cataleptiform state seen in rats. One patient after 60 mg. of prochlorperazine i.m., in divided dosage, began to exhibit involuntary movements of a post-encephalitic type. There was posturing, flexibilitas cerea and opisthotonos. Strangely, these involuntary movements could be controlled by command. He also showed dilatation of the pupils, reddening of the conjunctivae, epiphora, and oculogyric crises. There was tachycardia and raised blood pressure. His tongue protruded and became progressively swollen. Treatment was discontinued at this stage, and within two days all side-effects cleared up. When treatment was resumed with smaller doses no adverse effects appeared.

SUMMARY

A new therapeutic agent prochlorperazine ("Stemetil") was administered to 50 chronic male schizophrenics. The results were most encouraging, especially in the group of simple and hebephrenic schizophrenics. Affect and drive returned in the majority of those patients in whom chlorpromazine had failed. The drug is active in lower dosage than chlorpromazine, as was noted by Broussolle and Dubor (1956). Although drowsiness was not infrequently present early in the treatment it did not persist, and the patients were much more alert than chlorpromazine-treated patients. Serious side-effects were absent with the exception of the rather alarming extrapyramidal syndrome mentioned above. However, if the drug is introduced in small dosage, e.g. 10 mg. t.i.d., and gradually increased to the optimum, these side-effects are minimal and respond rapidly when prochlorperazine is combined with Phenergan 25 mg. t.i.d.

ACKNOWLEDGMENTS

We would like to thank Dr. E. U. H. Pentreath, Medical Superintendent, Pastures Hospital, Derby, for his permission to publish this series, the nursing and laboratory staff for their invaluable help, and May and Baker for the trial supplies of prochlorperazine.

REFERENCES

1. BAKER, A. A., and THORPE, J. G., "Deteriorated Psychotic Patients—their Treatment and its Assessment", *J. Ment. Sci.*, 1956, **102,** 780–789.
2. BROUSSOLLE, P., and DUBOR, P., "Preliminary Appraisal of the Clinical Effects of a New Neuroleptic", *Congr. Alién, Neurol.*, Bordeaux, 1956.
3. DUCROT, R., and KOETSCHET, P., "Anti-emetic Properties of a New Phenothiazine Derivative 3-Chloro-10-(3-N-methyl-piperazinylpropyl)-phenothiazine (6140 R.P.)", *Int. Physiol. Congr.*, Brussels, 1956.
4. SMITHY, G., and HOMBURGER, F., "Prochlorperazine for the Treatment of Nausea and Vomiting in Patients with Advanced Cancer and other Chronic Diseases", *New Eng. J. Med.*, 1957, **256,** 27.

CALCIUM, PHOSPHATE AND PHOSPHATASE IN MONGOLISM

By

J. STERN, Ph.D.

and

W. H. P. LEWIS, A.I.M.L.T.

Biochemistry Department, Fountain Hospital, London, S.W.17

Benda (1947) has reported values falling within the normal range for the serum calcium, phosphate and alkaline phosphatase in mongolism. More recently however Sobel *et al.* (1956) have stated that, while the inorganic phosphate and phosphatase are normal, the serum calcium is low in mongolism. The data on which this report was based do not appear to have been published to date. Further information on this point therefore seemed desirable.

Clinical Groups

Forty children with mongolism and an equal number of children with other forms of mental retardation were included in the investigation. Details are given in Table I. "Unclassified" here means that the mental defect could not be attributed to any one specific cause. The patients with cerebral palsy had also had one or more epileptic fits while in hospital. All the children had been in-patients at the Fountain Hospital for two months or longer and were in good health at the time of investigation. The diet consumed was well balanced and adequate in vitamins. Its composition was the same for all patients, only the consistency varied, depending on the child's ability to chew.

Table I

Classification of Cases

Mongolism	40
Unclassified	21
Microcephaly	9
Epilepsy	4
Cerebral palsy	3
Icterus gravis neonatorum	2
Hydrocephalus	1
Total	80

	Children with Mongolism	Controls
Mean age	7 years 3 months	7 years 4 months
Age range	2 years 5 months–12 years 4 months	2 years 7 months–12 years 11 months
Mean I.Q.	34	31
I.Q. range	10·62	3·67

Methods

Collection of Samples

About 0·5 ml. of capillary blood was obtained from a finger prick and allowed to clot in a 3/8 inch tube. The serum was separated within one hour by centrifuging for 10 minutes at 2,500 rev./min. and aliquots de-proteinized immediately with trichloroacetic acid for the estimation of the inorganic phosphate. Samples were always collected alternatively from children with mongolism and controls so that the time the samples were allowed to stand before separation was the same for both groups.

Chemical Methods

Calcium was estimated on 0·1 ml. of serum by the method of Stern and Lewis (1957a).

Inorganic phosphate was determined on 0·025 ml. of serum according to Weil-Malherbe and Green (1951) using one-quarter quantities of all reagents and a 1:1 mixture of *iso*-butanol benzene for the extraction of the molybdate complex.

Alkaline phosphatase was estimated on 0·04 ml. of serum by the method of King and Wootton (1956) scaled down by a factor of five, and acid phosphatase on 0·1 ml. according to the same authors with one half the volume of serum and one-fifth the volume of all other reagents.

RESULTS

A summary of the results obtained is given in Table II. The children with mongolism had a serum calcium level over 7 per cent. lower than that of the controls, the difference being highly significant statistically. The calcium level of the control group in its turn was lower than that of normal adults employed at the Fountain Hospital, 25 of whom were found to have a mean serum calcium level of 9·78±0·06 (S.E.) mg./100 ml. compared to 9·51±0·07 (S.E.) mg./100 ml. for our control group. The difference of 0·27 mg./100 ml. is significant ($t > 2{\cdot}660$, $P < 0{\cdot}01$).

The serum inorganic phosphate was significantly higher in the children with mongolism than in the controls. No age effect on the serum phosphate was demonstrable nor were significant differences established in the levels of the alkaline and acid phosphatases of the two groups.

DISCUSSION

The range and mean level of the alkaline phosphatase for the children with mongolism and the controls are reasonably close to values reported for normal children (Harrison *et al.*, 1948), as are the range and mean level of the acid phosphatase (Tuba, Cantor and Siemens, 1947). There is some uncertainty about the "normal" serum calcium level in children. Wilkinson (1957) found a mean level of 9·72±0·02 (S.E.) mg./100 ml. for a group of 710 children using E.D.T.A. titration. This is about 2 per cent. higher than the value for our control group. This difference is probably in part due to the serum protein level in children at the Fountain Hospital (Stern and Lewis, 1957b) being 0·3 mg./100 ml. lower than that in normal children (Beach *et al.*, 1948). On the other hand the differences in the serum proteins between children with mongolism and other mentally retarded children at the Fountain Hospital (Stern and Lewis, 1957b) are clearly too small to account for the observed differences in the calcium levels.

The lowered calcium and raised phosphate in the children with mongolism cannot be satisfactorily explained by hypofunction of the pituitary or thyroid which have from time to time been said to form part of the syndrome of mongolism, nor is there at present any evidence of a defect in calcium absorption or impairment of renal function which could give rise to the serum

TABLE II

Calcium, Inorganic Phosphorus, Alkaline Phosphatase and Acid Phosphatase in the Serum of Children with Mongolism and of Other Mentally Retarded Children as Controls
Significant Differences (P<0·05) are shown in Italic Type

	Children with Mongolism				Controls				Significance of Differences		
	N	Range	Mean	S.E.	N	Range	Mean	S.E.	Δ	t	P
Calcium .. .. .. (mg./100 ml.)	40	8·2– 9·3	8·8	0·05	40	9·1–10·4	9·5	0·07	*0·7*	>3·460	<0·001
Inorganic phosphorus .. (mg./100 ml.)	40	3·3– 6·5	5·0	0·10	40	3·0– 6·1	4·7	0·09	*0·3*	>2·000	<0·05
Alkaline phosphatase .. (K A units)	26	10·8 26·8	18·1	0·89	26	8·7–28·4	17·3	1·16	0·8	<0·679	>0·5
Acid phosphatase .. .. (K A units)	35	1·8– 3·7	2·8	0·09	27	1·7– 4·4	3·0	0·12	0·2	<1·658	>0·1

chemistry. In hypoparathyroidism the calcium is low and the inorganic phosphate high, but the serum changes described in this condition while qualitatively similar are much more pronounced than those reported here. The endocrine glands are said to be generally under-developed in mongolism (Benda, 1947) and the possibility cannot therefore be excluded that the control of calcium metabolism by the parathyroids is less efficient in these patients than in the controls. Alternatively our findings may reflect a metabolic abnormality in mongolism not yet understood.

SUMMARY

The serum calcium was found to be significantly lower and the serum inorganic phosphate higher in a group of forty children with mongolism compared to an equal number of children with other forms of mental retardation. No significant differences were found in the level of the serum alkaline and acid phosphatases.

ACKNOWLEDGMENTS

The authors are greatly indebted to Drs. L. T. Hilliard and B. H. Kirman for their interest and encouragement, to the staff of the Psychology Department for the test results quoted, and to the nursing staff for assistance with the collection of the samples.

REFERENCES

BEACH, E. F., HARRISON, A. P., LESHER, M., KAUCHER, M., RODERUCK, C., LAMECK, W., and MOYER, E. R., *J. Amer. diet. Ass.*, 1948, **24**, 405.

BENDA, C. E., *Mongolism and Cretinism*, 1947. London: Heinemann.

HARRISON, A. P., RODERUCK, C., LESHER, M., KAUCHER, M., MOYER, E. R., LAMECK, W., and BEACH, E. F., *J. Amer. diet. Ass.*, 1948, **24**, 503.

KING, E. J., and WOOTTON, I. D. P., *Micro-analysis in Medical Biochemistry*, 1956. 3rd ed. London: Churchill.

SOBEL, A. E., STRAZULLA, M., SHERMAN, B. S., ELKAN, B., MORGENSTERN, S. W., MARIUS, N., and MEISEL, A., *Clin. Chem.*, 1956, **2**, 289.

STERN, J., and LEWIS, W. H. P., *Clin. chim. Acta*, 1957a, **2**, 576.

Iidem, J. Ment. Sci., 1957b, **103**, 222.

TUBA, J., CANTOR, M. M., and SIEMENS, H., *J. Lab. clin. Med.*, 1947, **32**, 194.

WEIL-MALHERBE, H., and GREEN, R. H., *Biochem. J.*, 1951, **49**, 286.

WILKINSON, R. H., *J. clin. Path.*, 1957, **10**, 126.

SUICIDAL BEHAVIOUR IN DEPRESSIVE ILLNESS

A STUDY OF AETIOLOGICAL FACTORS IN SUICIDE

By

H. J. WALTON, M.D., D.P.M.

Formerly Senior Registrar
Maudsley Hospital, London, S.E.5
Now Psychiatrist
Department of Neurology and Psychiatry, University of Cape Town

HYPOTHESIS

AMONG factors held to be causally related to suicide are: (*i*) social isolation (1); (*ii*) social degeneration (2); (*iii*) parental deprivation (3, 4, 5). If these factors are aetiologically related to suicide, they should present prominently in that minority of depressive patients who attempt suicide. On the other hand, these factors should be found less frequently in non-suicidal depressive patients. The hypothesis that a factor is causally related will not be supported if it is found to occur as frequently among non-suicidal depressive patients as among those showing both depression and suicidal behaviour.

EXPERIMENTAL DESIGN

The detailed case notes were examined of all patients with depressive illness hospitalized in the Maudsley and Bethlem Royal Hospitals during 1955. The patients were separated into two groups (Table I): (*A*) Non-suicidal depressive patients; (*B*) Suicidal depressive patients.

TABLE I

Total	Non-suicidal	Suicidal	
223	163	60	20 serious attempts 25 mild attempts 15 suicide threats

The suicidal group of 60 patients was made up of patients with depressive illness who had attempted suicide, and also those who had expressed to some other person a threat of suicide taken seriously enough to rank among the reasons for admitting the patient to hospital. Those patients with suicidal ideas only, i.e., those who, after admission, expressed to the examining physician troubling thoughts that they would or should kill themselves, were not included in the suicidal group.

The two groups thus separated were then examined for the incidence in each of the three hypothesized causal factors, which were defined as follows:

(i) *Parental deprivation:* loss of a parent before the age of 14 years; or strife between the parents so gross that in the initial interview the patient described violence taking place repeatedly between the parents; or as an outcome of parental disharmony a feeling of prolonged estrangement from one of the parents.

(ii) *Social isolation:* at the time of becoming ill the patient had lived alone in private rooms, or a boarding house or an hotel.

(iii) *Social degeneration:* there had occurred before the onset of illness loss of a job, divorce, the birth of an illegitimate child, or a cutting off from social contact (ostracism due to a criminal act, immigration to an alien community without finding acceptance in it).

Experimental Findings

Among the 60 patients who were both depressed and suicidal, parental deprivation occurred in 46, social isolation in 6, and social degeneration in 10 (Table II). In the other group, of non-suicidal depressives (163 cases), the corresponding incidence of the three factors was 32 cases, 17 cases and 19 cases.

Table II

Frequency of Factors "Parental Deprivation", "Isolation" and "Degeneration"

	Suicidal Depressives 60 Cases		Non-suicidal Depressives 163 Cases		Chi-square	P
	Yes	No	Yes	No		
Parental deprivation	46	14	32	131	62·69	P<·01
Social isolation	6	54	17	146	·00	P<·99
Social degeneration	10	50	19	144	·96	·50>P>·30

Statistical Analysis

Parental deprivation: For this factor χ^2 is highly significant, well beyond the ·01 level of significance. A significant association is thus found between suicidal attempt or threat and the occurrence during childhood of parental deprivation. An examination of the fourfold table shows that the greatest contribution to the total χ^2 comes from the cell associating suicidal behaviour with parental deprivation.

Social isolation: For this factor χ^2 is not significant, the possibility of its occurring in association with suicidal behaviour being that of chance.

Social degeneration: For this factor χ^2 is not significant, the possibility of its occurring by chance being about 1 in 2.

Discussion

1. *Ecological and Psychological "Causes" of Suicide*

Suicidal behaviour is a highly complex phenomenon. No single factor brings it about. Aetiological factors can be understood only as part-causes, affecting the total psychophysical make-up of an individual who is relating in varied ways to his special environment.

In the renewed attention accorded the phenomenon of suicide during recent years (2, 1), sociological studies have extended the proposition of Durkheim (6) that suicide is due to social disintegration and isolation.

Psychiatric research has not yielded so neat and manageable an hypothesis. The complex information derived from clinical study of individual patients does not lend itself readily to statistical generalization. However, many psychiatrists interested in suicide have been struck by the prevalence of "broken homes" in the case histories of suicide and attempted suicide. This finding has not been placed on a statistical basis; all that can be shown is the apparently high percentage of disturbed parental relationships among suicidal patients themselves.

It is a criticism of some of this work that criteria have been unduly lax, e.g., Batchelor when assessing parental deprivation defines childhood at the high limit of 17 years. Probably by this age a sizeable proportion of non-suicidal persons also will have been deprived of one of their parents. In this experiment the age-criterion was narrowed, the parental loss (or estrangement) required to have taken place before the age of 14 years. In this experiment, furthermore, a standard of comparison is obtained by matching suicidal patients with non-suicidal patients having the same psychiatric disorder. When this is done, it is seen that parental deprivation very significantly distinguishes the suicidal from the non-suicidal group.

Ecological hypotheses have not been neglected by psychiatric investigators, some of whom have produced findings to validate the causal association of sociological factors with suicide. Ruth Cavan (2) had shown in 1928 that in Chicago suicide was commonest in the central rooming-house areas. Sainsbury (1) demonstrated that ecological factors are correlated with the occurrence of suicide; he found that 27 per cent. of persons dying by suicide had lived in isolation. (He also confirmed the finding that suicide rates in a particular area correspond closely with the divorce incidence in it.) Investigating attempted suicide, Stengel (7) found that 22 per cent. of patients admitted to an observation ward following attempted suicide had been living alone, an incidence of isolation reckoned to be three times that of the normal population.

In this experiment, the factor of social isolation does not distinguish at all the suicidal from the non-suicidal depressive group; this factor, therefore, cannot be considered causative of suicidal behaviour in the patient sample under investigation. The factor of social degeneration does not significantly distinguish the suicidal group either; evidence is thus not obtained that loss of a job, foreign birth, divorce, an illegitimate child or a criminal action distinguishes the suicidal from the non-suicidal depressive patient in the case material studied.

2. *Relation of Suicide and Attempted Suicide*

Suicide and attempted suicide do not appear related so closely as to differ only in outcome. Suicides comprise a somewhat different population from attempted suicide. Women are in the majority in cases of attempted suicide, but in a minority among suicides. Attempted suicide is more common in the younger age group than suicide. While attempted suicide is many times more common than suicide, only a minority of suicides appears previously to have attempted suicide. Sainsbury (1) found that in 9 per cent. of his cases of suicide in North London 1936–1938, a previous suicidal attempt had been recorded. Stengel (8) found a higher proportion; a record of previous suicidal attempt was present in 13 per cent. of 119 suicides in 1953 in the same area.

The findings of this investigation, dealing as it does with suicidal behaviour short of successful suicide, cannot therefore be applied directly to suicide. On the other hand, psychiatric understanding of the phenomenon of suicide will continue to be derived from cases of attempted suicide; death removes the patient from the possibility of being studied, and psychiatric issues can rarely be studied in patients unable to reflect or talk. The present patient-sample contains 45 cases of attempted suicide, and also included are 15 patients who made overt threats of suicide to others. It may be objected that only those patients making a definite suicidal attempt should have been held to constitute the suicidal depressive group.

If the statistical significance of the three postulated factors is determined when the patient-sample is divided according to the occurrence of overt suicidal attempts, depressive patients not attempting suicide number 178 cases and those attempting suicide 45 cases. The statistical association of suicidal behaviour (overt attempt) with parental deprivation is found to be highly significant (Table III). On the other hand, both the factors of social isolation and of social degeneration are seen to be of no significance.

TABLE III

Occurrence of the Three Factors in Depressive Patients Making Actual Suicidal Attempts (Suicidal Threats not Included)

	Suicidal	Non-suicidal	Chi-square	P
Deprivation ..	32	46	32·35	P<·01
Isolation	5	18	·038	·90>P>·98
Degeneration ..	6	23	·0052	·90>P>·80

In these patients the suicidal attempt was more often mild than serious. However, such distinction is of limited clinical usefulness; a mild attempt does not necessarily imply that a patient was poorly motivated towards suicide. In depressive illness physicians customarily give grave attention to any suicidal manifestation.

Suicidal threats have been given weight in this investigation. Suicidal ideas have not. Even when the patient described marked suicidal rumination which may have been disturbing him for some time before admission, if he had failed to exteriorize such ideas in the shape of a threat, his case was not classed among the suicidal group. (The impression is not intended that threats necessarily indicate a graver risk of suicide than unexpressed suicidal ideas would constitute.) If only overt attempts are studied, and suicidal threats excluded from consideration, a very partial picture of the suicidal component in depressive illness will be conveyed. It is also necessary to mention that this study deals exclusively with each patient's illness during 1955; a proportion of patients behaved suicidally before 1955 or subsequently, while being non-suicidal during the period under investigation, and vice versa.

Age is an important factor in suicide. The suicide rate is found to be highest in the aged; Swinscow (9) calculated that for recent years the average age of suicide in men was 61 years and in women 57 years. As shown in Table IV, for the sample of depressive patients under investigation, suicidal behaviour is about equally common in the fourth, fifth and sixth decades. Thus for the sample of depressive patients studied, age was not an important correlate of suicidal behaviour.

TABLE IV

Age and Sex Distribution

	Non-suicidal	Suicidal
Under 20 years	1	2
20–29	18	10
30–39	42	13
40–49	32	13
50–59	33	11
60–69	26	9
70–79	11	2
Male	60	17
Female	103	43
Total	163	60

In the sample studied, women showed suicidal behaviour considerably more often than male depressed patients.

3. *Depression and Suicide*

The association of suicide with depressive illness has been over-emphasized at times. Suicide is a common hazard in patients with depressive illness, but it occurs also in schizophrenia, in psychopathic states, in cases of psychoneurosis and in persons who may not be considered psychiatrically abnormal. The majority of patients with depressive illness show no sign of suicidal behaviour, nor do they admit to suicidal intentions when questioned. It follows, therefore, that when a patient with depressive illness behaves suicidally, other factors than those producing the depressive mood must have operated.

It is controversial whether cases of depressive illness, in consideration of aetiology, course or outcome, can be subdivided into two categories, endogenous and reactive. In practice the validity of such a distinction is frequently doubted at the hospitals where this group of depressive patients was treated. All patients were diagnosed as having depressive illness. The following diagnostic categories were included: depressive psychosis, reactive depression (in some of the patients thus diagnosed neurotic symptomatology or abnormal personality traits were marked), and agitated depression (including the involutional depressive syndrome).

Because of the tendency in many cases to refrain from making a distinction between either endogenous or reactive (psychogenic) disorder, it cannot be stated what proportion of the depressive patients were allocated at the time of hospitalization to each of these categories. Although a retrospective assessment may be attempted from scrutiny of the case records, the results cannot be viewed with much confidence. Nevertheless, such tentative estimate as might be attempted would be of interest if it emerged that suicidal behaviour appeared to predominate in either the endogenous or the reactive category. Such is not the case (Table V). There appears to be no significant association between suicidal behaviour and either diagnostic category. ($\chi^2 = \cdot 0452$; $\cdot 90 > P > \cdot 80$).

4. *The Factors Producing Suicide-Proneness*

In Britain there is legal restriction against suicide, in addition to the social stigma found in other countries. In spite of being contrary to the mores of the community and against the law as well suicidal behaviour takes place regularly. The causes of suicide are not yet established. Aetiological hypotheses have been provided by psychiatric and sociological studies, and may be tested experimentally.

In this experiment an attempt has been made to provide a control group of non-suicidal patients suffering from a similar mental disturbance as that exhibited by the suicidal patients. The occurrence in the two groups of another variable, the psychogenic as against the endogenous nature of the depression, appears also to have been controlled. The two groups separated for study varied chiefly in that suicidal behaviour occurs in one of them.

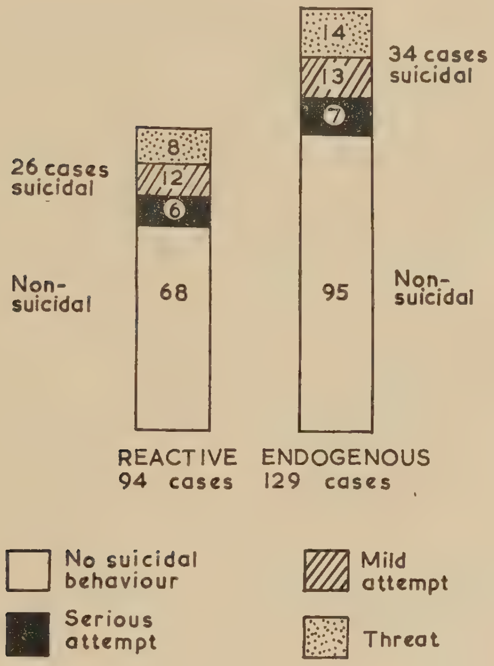
The suicidal group of patients is not differentiated from the non-suicidal group by either of the two sociological causative concepts postulated by ecological workers. On the other hand, the suicidal group is strongly differentiated by the occurrence of parental deprivation in it. This experimental finding confirms the theory that disturbed parental relationship in childhood

TABLE V

Classification of Suicidal Depressive Patients into "Endogenous" and "Reactive" Categories

	Reactive	Endogenous
Non-suicidal depressives	68	95
Suicidal depressives	26	34
Serious attempts	6	14
Mild attempts	12	13
Threats	8	7

Suicidal Behaviour in "Endogenous" and "Reactive" Groups. Histogram.



may be suicidogenic. Absence of a parent in early life or gross parental disharmony may predispose persons with depressive illness to suicidal attempts.

(i) *Social Isolation:* Faris and Dunham hold that social isolation produces suicide (10). Sainsbury's finding supports this. There is thus evidence that the relation between the solitary mode of life and suicide is probably one of cause and effect. Support is not given to this hypothesis by study of the present small group of patients.

(ii) *Social Degeneration:* High suicide rates have been found in areas where divorce, illegitimacy and other indices of social degeneration are prevalent. The present study does not provide confirmation.

(iii) *Parental Deprivation:* Because ecological studies deal with neighbourhoods and not with individuals, an ecological finding does not implicate particular persons in the neighbourhood factor yielded by a statistical survey. Only direct clinical study finds which particular individuals are affected. In this experiment, evidence is not obtained that such neighbourhood factors as "social isolation" and "social degeneration" operate in a direct association with suicidal behaviour in depressive patients. The childhood experience of "parental deprivation", on the other hand, increases suicide-proneness in depressive patients.

There is much evidence that ecological factors play some part in causation of mental disorder. Such factors are important to define, for they may be easier to manipulate than the psychological responses of psychiatrically disturbed adults. But investigation of the relation of these social correlates of mental disorder, as Lewis (11) has commented, is held up at present by a grave lack of methods for studying the direct interplay between social process and psychological process.

How can the clinical finding of family disturbance predisposing to suicide, which this study supports, be reconciled with neighbourhood factors which ecological studies have shown to be statistically linked with suicide? A possible explanation is that social disorganization in an area leads to increased deterioration in that area of family bonds. It may be that in a disorganized neighbourhood parents more often tend to become separated from or neglectful of their offspring. Such children in later life, having lacked adequate involvement with two parents (who were to have conveyed to their children the cultural norms), fail to accomplish satisfying personal relationships in adult life and may behave suicidally. As this study suggests, the parental inadequacy will have affected the child directly. The adverse neighbourhood conditions may have served to increase the inadequacy of his parents. Ecological factors may be related in this secondary way to the occurrence of suicide, and not be found reflected directly in the suicidal behaviour of depressive patients.

That this study has not yielded a positive correlation of social isolation and degeneration with suicidal behaviour may be explained, on the other hand, by the case material on which it is based. The patient-sample was a highly selected one. The patients were brought into hospital by a responsible relative in most cases, an admission requirement perhaps serving to exclude some patients living under conditions of isolation and social degeneration. In addition, ecological studies have dealt mainly with suicide, while this investigation studied suicidal attempts and threats. Against a possible interpretation that suicide occurs under conditions of social isolation, while suicidal attempts occur in people who are not isolated, is the report (7) of a high occurrence of social isolation among attempted suicides.

SUMMARY

1. The hypothesis was tested that (*a*) parental deprivation, (*b*) social isolation and (*c*) social degeneration are related to suicidal behaviour.

2. Patients hospitalized during the course of a year with depressive illness were subdivided into two groups: Suicidal (60 patients) and Non-suicidal (163 patients).

3. The two groups were not differentiated by the incidence in them of social isolation or social degeneration.

4. Parental deprivation during childhood was very significantly associated with suicidal behaviour in depressive illness.

ACKNOWLEDGMENTS

I wish to thank Professor Aubrey Lewis for helpful advice, and Professor E. Stenge for valued discussion and criticism.

REFERENCES

1. SAINSBURY, PETER, *Suicide in London*, 1955. London: Chapman and Hall Ltd.
2. CAVAN, R. S., *Suicide*, 1928. Chicago: The University of Chicago Press.

3. Zilboorg, G., "Differential Diagnostic Types of Suicide", *Arch. Neurol. Psychiat.*, 1936, **35,** 270.
4. Teicher, J. D., "A Study in Attempted Suicide", *J. Nerv. Ment. Dis.*, 1947, **105,** 283.
5. Batchelor, I. R. C., and Napier, M., "Broken Homes and Attempted Suicide", *Brit. J. Delinq.*, 1953, **4,** 99.
6. Durkheim, E., *Suicide, A Study in Sociology* (Translation), 1952. London: Routledge and Kegan Paul.
7. Stengel, E., "The Social Effects of Attempted Suicide", *Canad. Med. Ass. J.*, 1956, **74,** 116.
8. *Idem* and Cook, N., "Recent Research into Suicide and Attempted Suicide", *J. Forensic Med.*, 1954, **1,** 252.
9. Swinscow, D., "Some Suicide Statistics", *Brit. Med. J.*, 1951, *i*, 1417.
10. Faris, R. E. L., and Dunham, H. W., *Mental Disorders in Urban Areas*, 1939. Chicago: The University of Chicago Press.
11. Lewis, A., "Statistical Aspects of Suicide", *Canad. Med. Ass. J.*, 1956, **74,** 99.

Reviews

Experimental Design in Psychology and the Medical Sciences. By A. E. Maxwell. Methuen & Co., London, 1958. Pp.147. Price 17*s.* 6*d.*

The author's aim is to describe the principles of experimental design, with emphasis on those forms that are likely to be specially useful in medicine and psychiatry. It is refreshingly modern in its approach, for it treats the logic of design first, with the statistical techniques then falling into their natural place, as methods for taking advantage of what skilful design (and *only* skilful design) makes available. Those who read this book will never again go back to the old method of collecting muddled and poorly arranged data, and then expecting the statistician to make the best of it.

The book is clearly written, and suitable for the beginner (provided he can get some help at the difficult places, and provided he is prepared to study the subject seriously). Its methods are specially selected for those problems that occur frequently in psychiatric research. Thus he pays special attention to that feature, so common in our work yet so little treated in the books, in which the subject studied is undergoing some irreversible change during the experiment. Thus, if the same test is applied repeatedly, the subject learns; if the same stimuli are applied, the subject habituates. And a patient cannot be studied first leucotomized and then normal. The book contains useful accounts of methods for these cases that have so far appeared only in technical journals.

Research workers in the psychiatric world cannot do better than take this book and its methods as a pattern of how experiments should be first planned and then analysed. The worker of today who does not know, for instance, how to use randomized blocks is handicapping himself severely.

W. Ross Ashby.

The Dynamics of Anxiety and Hysteria. By H. J. Eysenck. Routledge & Kegan Paul, London, 1957. Pp. 311. Price 32*s.*

Its subtitle "An experimental application of modern learning theory to psychiatry" indicates its general theme, and it gives, of course, an authoritative account of the work being done at the Institute of Psychiatry, the Maudsley Hospital, to bring psychiatric diagnosis and prognosis into the world of the exact sciences. In this way it is a valuable review of a number of published papers, showing the reasoning behind them and their coherence as a pattern.

The title may suggest an account of Freudian dynamics; in fact the book is concerned with the dynamics of Hull and Pavlov. A full account of their main tenets is given so far as they are relevant to the purpose.

Towards the end of the book the author emphasizes psychiatry's outstanding need for investigations into the objective efficacy of the various treatments that are used. The techniques (experimental and statistical) for such assessments have been available for twenty years—how much longer are we to wait before a serious attempt, with proper controls, is made to get at the truth?

W. Ross Ashby.

Bibliography and Epitome

VOL. 57 ACTA NEUR. PSYCHIAT. BELG. JULY, 1957

Considerations on the Problem of Old People Afflicted with Mental Illness. *Bruyninckx, E.* .. 537
The Tonic Reflex of the Palm of the Hand. *Botez, M. I.* .. 551
Angiography of the Vertebral Artery by Catheterisation of the Radial Artery. *Martin, P., and Potvliege, R.* .. 562
The Examination of Recent Memory in Korsakow's Disease of Alcoholic Origin. *Crahay, S.* .. 570
Brief Psychotherapy in Bronchial Asthma. *Luminet, D.* .. 582

AUGUST

Meningo-myelo-encephalitis in Behçet's Disease. *Viane, A.* .. 599
An Experimental Contribution to the Study of "Amnesia of Fixation" in Korsakow's Disease of Alcoholic Origin. *Nyssen, R.* .. 639
An Essay on the Association of Doridene-Serpasil in Some States of Psychomotor Excitation. *Bongaerts, C.* .. 667

SEPTEMBER

A Nosometric Study of Multiple Sclerosis. *Alexander, L., et al.* .. 685
Etioepidemological and Clinical Characteristics of the Last Epidemic of Poliomyelitis in Barcelona. *Rodriguez-Arias, B., and Soler-Dopff, C.* .. 703
The Pathology of Gliomas. *Stochdorph, O.* .. 711
Congenital Myotonia with E.C.G. Alterations in the Negro. *Vincent, M.* .. 720
Chordoma and Trauma. *Piraux, A.* .. 728
Massive Alimentary Intoxication with D.D.T. *Piraux, A.* .. 733
EEG Study of a Case of Sub-acute Post-rubeolar Encephalitis. *Carels, G.* .. 741

OCTOBER

Acute Necrosing Encephalitis with Temporal Predominance. *Van Gehuchten, P., et al.* 763
An Anatomo-clinical Study of a Case of Subacute Sclerosing Leucoencephalitis. *Brucher, J. M., and Dechef, G.* .. 775
A Bony Gap in the Cranial Vault, with an Underlying Porencephalic Cyst of Obstetric Origin, in an Adult. *Brihaye, J., et al.* .. 803
The Nosography of Senile Chorea. *Flament, J.* .. 830

VOL. 32 ACTA PSYCHIAT. NEUROL. SCAND. 1957

An Investigation of the Questionnaire Method by Means of the Cornell Index (Form N2). I. *Arentsen, K.* .. 231
An Investigation of the Questionnaire Method by Means of the Cornell Index (Form N2). II. *Arentsen, K.* .. 257
*Memory Disturbances after Electroconvulsive Therapy. *Cronholm, B., and Molander, L.* 280
A Family-Study with Otological, Neurological and Ophthalmological Aspects. *Everberg, G.* .. 307
Classification of Dysarthrias. *Grewel, F.* .. 325
Anaphylactic Shock During Psychiatric Insulin Therapy. *Kjær-Larsen, J.* .. 338
*Personality Changes in Electroconvulsive Treatment. *Stenbäck, A., et al.* .. 345

Memory Disturbances after Electroconvulsive Therapy

It has been shown that electroconvulsive therapy has an adverse effect on the operationally defined variables "immediate reproduction", "delayed reproduction", "retention", and "forgetting" in three memory tests constructed for this study, called the 30 word pair test, the 20 figure test and the short story test. It may be concluded that electroconvulsive therapy has an adverse effect on the hypothetical variable "*retention*". It may also have an adverse effect on the hypothetical variables "*learning*" and "*recall*", but to a much smaller extent.

A study of the percentage of wrong answers among the failures three hours after learning in the word pair test does not lend support to *Janis*' hypothesis of a primary disturbance of "recall processes" after electroconvulsive therapy—the existence of such a disturbance of course not being disproved.

These conclusions are valid only for the time when the examination was done, i.e. six hours after the second treatment. The three memory tests mentioned may also, however, be useful in studying intellectual disturbances at a longer interval after treatment.

(Authors' Abstr.)

Personality Changes in Electroconvulsive Treatment

The present study was carried out in order to throw light on the following questions: (1) Are memory disturbances to be found in patients one week after three electroconvulsive treatments? (2) Are there any personality changes observable by the Rorschach test at the same interval after treatment? (3) Are there any differences in memory disturbances and other personality changes after three electroconvulsive treatments given twice a week or as a "block" on three successive days which could explain the clinically observed better effect of the block treatment?

The memory tests given to 37 patients revealed general improvement of results in the post-treatment investigation, the improvement being slightly better in the 16 patients treated with block E.C.T. The memory improvement is interpreted as due to the changes in emotional life brought about by E.C.T. This emotional improvement counterbalances the persisting psycho-organic symptoms which are evidenced in the post-treatment Rorschach tests. The Rorschach findings confirm the hypothesis (*von Baeyer and Grobe*, 1947) that the effect of E.C.T., even when given only three times, depends upon the psycho-organic syndrome which develops as a sequel of the treatment. However, it is not the psycho-organic syndrome as such which brings about the therapeutic remission, but this is produced by the reconstruction of the inner life, which takes place after each electroconvulsive treatment (Delay, 1946; Alexander, 1954) and it is this reconstruction that is profoundly affected by the psycho-organic syndrome. The hypothesis is put forward that the better effect of block E.C.T. is due to the slightly more pronounced organic injury and to the shorter intervals which obstruct a complete reconstruction of the later life during the intervals.

(Authors' Abstr.)

An Investigation of the Questionnaire Method by Means of the Cornell Index (Form N2). III. *Arentsen, K.* 361
An Investigation of the Questionnaire Method by Means of the Cornell Index (Form N2). IV. *Arentsen, K.* 379
Cranial and Cerebral Hydatid Disease. *Arseni, C., and Samitca, D.* 389
Scandinavian Literature on Psychiatric Genetics and Epidemiology. *Astrup, C.* .. 399
An Unusual Complication in Connection with Metrazol-shock Treatment. *Bagge, L., and Schlaug, R.* 425
On Thrombosis of the Basilar Artery. *Frantzen, E., and Olivarius, B. de Fine* 431
Dysarthria in Post-encephalitic Parkinsonism. *Grewel, F.* 440
Pigmentary Retinal Lipoid Neuronal Heredodegeneration (Spielmeyer-Vogt Disease). *Hoffman, J.* 450
Different Neuroses in a Pair of Identical Twins. *Stenbäck, A.* 457
*Psychological Studies on a Patient who Received 441 Electroconvulsive Treatments. *Stenbäck, A., and Viitamäki, R.* 473

Psychological Studies on a Patient Who Received 441 Electroconvulsive Treatments

The general impression obtained in the investigation of recall of dates and names was the same as in the psychological tests: A positive, cheerful attitude to the testing, serious attempts at solving the tasks, naïve delight at success, without knowledge of her mental deterioration. Although some improvement took place in the weeks following E.C.T., her psycho-organic symptoms were conspicuously more severe than those of the patients previously studied by the authors one week after three electroconvulsive treatments. Hence it seems justifiable to infer that a great number of electroconvulsive treatments cannot be given without producing psycho-organic changes in personality. Häfner (1951) came to the same conclusion regarding the effect of repeated blocks of E.C.T. Almost all the patients studied by Rabin (1948) showed personality changes of psycho-organic origin.

After a review of the literature on the effect of a great number of electroconvulsive treatments, a report is given on the results of psychological testing of a patient who had received 441 electroconvulsive treatments. Evidence is presented of psycho-organic changes of personality.

(Authors' Abstr.)

ACTA PSYCHIAT. NEUR. SCAND. SUPPT. 1957

Oligophrenia in Combination with Congenital Ichthyosis and Spastic Disorders. *Sjogren, T., and Larsson, T.* .. .. No. 113
A Follow-up Study of 225 Patients with Acute Schizophrenia and Schizophreniform Psychoses. *Holmboe, R., and Astrup, C.* .. .. No. 115
Mental Disorders in Thyroidectomized Patients. *Carpelan, H.* .. .. .. No. 116

VOL. 62 **AM. J. MENT. DEFIC.** JULY, 1957

A Group Therapy Experiment with Mothers of Mentally Deficient Children. *Rankin, J. E.* 49
Tuberculosis Control in Schools for Mental Defectives. *Spencer, G. E.* 56
The Effect of Reserpine in 200 Mentally Retarded Children. *Timberlake, W. H., et al.* 61
Pigmentary Retinal Lipoid Neuronal Heredodegeneration (Spielmeyer-Vogt Disease). *Hoffman, J., and Riepenhoff, J. P.* 67

Imbecility and Color Blindness. *O'Connor, N.* 83
Rorschach "Inner Life" Capacity of Imbeciles Under Varied Conditions. *Chambers, G. S., and Hamlin, R. M.* 88
Cognitive Changes in Low-Grade Defectives. *Walton, D., and Begg, T. L.* 96
Differentiation between the Mental Defective with Psychosis and the Childhood Schizophrenic Functioning as a Mental Defective. *Cassell, R. H.* 103
On the Psychology of Microcephalics. *Korsakov, S. S.* 108
Some Characteristics of Mongoloids Evaluated in a Clinic for Children with Retarded Mental Development. *Wunsch, W. L.* 122
Some Basic Considerations in Social Work with the Mentally Retarded. *Hesselschwerdt, P., et al.* 131

SEPTEMBER

Effects of Serpasil and Accent on Behavior, Intelligence, and Physiology. *Pallister, P. D., and Stevens, R. R.* 267
The Thyroid Function in Mongoloids as Determined by the Measurement of Protein Bound Iodine. *Bellack, S., and Albaum, J.* 275
Clinical Experience with Serpasil and Thorazine in Treatment of Disturbed Behavior of Mentally Retarded. *Wolfson, I. N.* 276
Effects of Methyl-Phenidylacetate (Retalin) on Drug-Induced Drowsiness in Mentally Retarded Patients. *Levy, J. M., et al.* 284
Hypertelorism with Unusual Associated Anomalies. *MacGillivray, R. C.* 288
The Clinical Use of Reserpine and Chlorpromazine in the Care of the Mentally Deficient. *Johnston, A. H., and Martin, C. H.* 292
Symposium: Social Adjustment of the Mentally Deficient:
  I.—Recent English Research. *Clark, A. D. B.* 295
  II.—Adult Adjustment of Some Deficient American Children. *Charles, D. C.* 300
  III.—Family Care in Denmark. *Wildenskov, H. O. T.* 304
Interpersonal Relations within a Special Class Group. *Goodnick, B.* 310
Toward the Concept of a "Just Noticeable Difference" in I.Q. Remediation. *Blackman, L. S.* 322
Performance of Familial Mentally Deficient Children in Response to Motivation on the Goodenough Draw-A-Man Test. *Hunt, B., and Patterson, R. M.* 326
The Relationship between the Stanford-Binet (Form L) Vocabulary and the Columbia Mental Maturity Scale in a Group of Mentally Retarded Children. *May, W. T., and Perry, H. W.* 330
Discrimination Set in Defectives. *Barnett, C. D., and Cantor, G. N.* 334
Discrimination Among Mental Defective, Normal, Schizophrenic and Brain-Damaged Subjects on the Visual-Verbal Concept Formation Test. *Siegel, S. M.* 338
An Experimental Inquiry Concerning the Prevalence of Popular Misconceptions Relating to Mental Deficiency. *Winthrop, H., and Taylor, H.* 344

NOVEMBER

A Method for Determination of Probabilities of Stay, Release, and Death, for Patients Admitted to a Hospital for the Mentally Deficient: The Experience of Pacific State Hospital During the Period 1948–1952. *Kramer, M., et al.* 481
Family History of a Mongolian Girl Who Bore a Mongolian Child. *Rehn, A. T.* 496
A Woman with Mongolism and Her Child. *Forrsman, H., and Torsten, T.* 500
Mandibulofacial Dysostosis with Oligophrenia in Siblings. *Gibson, R.* 504
The Relationship of Age, Intelligence and Sex to Motor Proficiency in Mental Defectives. *Rabin, H. M.* 507
Group Counseling for Social Adjustment. *Appel, E., and Martin, C. H.* 517
Conditions Associated with the Mother's Estimate of the Ability of Her Retarded Child. *Ewert, J. C., and Green, M. W.* 521
Reaction Time in Mental Defectives with Organic and Familial Etiology. *Bensberg, G. J., and Cantor, G. N.* 534
Accelerated Intellectual Growth and Personality Development as Seen in Phenylketonuric Subjects During Medical Treatment. *Clader, D.* 538
Effect of "Thorazine" on Wechsler Scores. *Ison, M. G.* 543
Concrete and Abstract Thinking in Organic and Non-Organic Mentally Retarded Children. *Weatherwax, J., and Benoit, E. P.* 548
Facilitating Community Contributions by Psychologists. *Soloyanis, G.* 554

VOL. 27 AM. J. ORTHOPSYCHIAT. JULY, 1957

Social Health—An Increasing Dimension in Orthopsychiatry. *Woodward, L. E.* 445
Some Applications of Psychoanalytic Insights to the Socialization of Children. *Johnson, A. M., and Giffin, M. E.* 462
A Religious View of Social Values. *Hiltner, S.* 475
Mental Deficiency in the Urban Community. *Heiser, K. F.* 484
A Study of the Problem of Mental Retardation in a Large Urban Community. *Ferguson, R. G.* 490

The Relationship of the Flower and Fifth Avenue Hospital Clinic for Mentally Retarded Children to a Community-Wide Program in an Urban Setting. *Michal-Smith, H., et. al.* 502
Present-Day Society and the Adolescent. *Gardner, G. E.* 508
Group Treatment for Emotionally Disturbed and Potentially Delinquent Boys and Girls. Workshop, 1956. *Stranahan, M., et al.* 518
Motivation and Frustration in Delinquency. *Jenkins, R. L.* 528
Patterns of Orientation in Children in Residential Treatment for Severe Behavior Disorders. *Pollack, M., and Goldfarb, W.* 538
When the Childhood Schizophrenic Grows Up. *Freedman A. M., and Bender, L.* .. 553
Tests Designed to Discover Potential Reading Difficulties at the Six-Year-Old Level. *Hirsch, K. de* 566
Unevenness of Growth in Its Relation to Vulnerability, Anxiety, Ego Weakness, and the Schizophrenic Patterns. *Hellersberg, E. F.* 577
The Treatment Process with Both Parents Together. *Hallowitz, D., et al.* 587
Therapy of a Child Conducted in the Setting of an Automobile. *Reiser, D. E., et al.* 608
Therapeutic Effort and Therapeutic Situation. *Wyatt, F.* 616
The Role of a Psychiatrist in a Well-Baby Clinic. *Judas, I., et al.* 621
Is There a Place for a Mental Health Nurse in a Child Guidance Clinic? *Jordan, P. H., and Campbell, M.* 630
Problems in the Development of a Treatment Program in a Traveling Child Guidance Clinic. *Young, R. J., et al.* 637
Concepts in Establishing Mental Health Clinic Reporting: Workshop Report. *Kramer, M.* 643

OCTOBER

Ambulatory (Borderline) Schizophrenia: Psychodiagnostics and Implications from Psychological Data. *Kutash, S. B.* 667
Further Observations on Ambulatory Schizophrenias. *Zilboorg, G.* 677
Childhood Psychosis:
1. Childhood Schizophrenia: Treatment of Children and Parents. *Kaufman, I., et al.* 683
2. Play Patterns as Nonverbal Indices of Ego Functions: A Preliminary Report. *Loomis, E. A., Jr., et al.* 691
3. Routines: A Pilot Study of Three Selected Routines and Their Impact upon the Child in Residential Treatment. *Maier, H. W., and Campbell, S. G.* .. 701
4. Discussion. *Beck, S. J.* 710

The Fathers of Autistic Children. *Eisenberg, L.* 715
The Culture of Interpersonal Relations in a Therapeutic Institution for Emotionally Disturbed Children. *Henry, J.* 725
Selection of Psychiatric In-patients for Treatment at a Municipal General Hospital. *MacLeod, J. A., and Hirt, J. V.* 735
Use of a Standard Observation for the Psychological Evaluation of Nonspeaking Children. *Jahoda, H., and Goldfarb, W.* 745
The Development, Meaning and Management of School Phobia. Workshop, 1956. *Waldfogel, S., et al.* 754
Sociological Research in Juvenile Delinquency. *Cohen, A. K.* 781
What Happens to Psychiatric Contributions in the Juvenile Court Setting, *Markey, O. B., and Langsam, C. L.* 789
Fantasies in Children Prior to Herniorrhaphy. *Falstein, E. I., et al.* 800
Preliminary Report of a Preschool Therapy Group in a Children's Hospital. *Fineberg, H. H., and Johnson, M.* 808
A Survey Assessment of Current Parental Attitudes and Practices in Child Rearing. *Cole, N. J., et al.* 815
Report of a Constipated Child with Fecal Withholding. *Segall, A.* 823

VOL. 114 AM. J. PSYCHIAT. AUGUST, 1957

European and British Psychiatry. *Rodger, T. F.* 97
International Psychiatry. *Galdston, I.* 103
American Psychiatry. *Whitehorn, J. C.* 109
Growth and Aging. *Bortz, E. L.* 114
Perception and Interpersonal Relations. *Cantril, H.* 119
Experience with Photic Stimulation in Psychiatric Research. *Ulett, G. A.* 127
Methods Employed and Results Obtained in Psychiatric Studies with New Drugs Acting on the Brain Stem. *Mielke, F. A.* 134
*Transorbital Leucotomy in Non-Institutional Cases. *Gardner, A.* 140
*Clinical Evaluation of Pacatal. *Feldman, P. E.* 143
The Defective Delinquent. *Bowman, P. W.* 147
Is the Human Personality More Plastic in Infancy and Childhood? *Stevenson, I.* .. 152
Duplication, Double Orientation and Fusion. *Levin, M.* 162
Narcotic Bondage: A General Theory of the Dependence on Narcotic Drugs. *Rado, S.* 165

Transorbital Leucotomy in Non-Institutional Cases

Results in 115 cases of transorbital leucotomy of non-institutional patients are reported. The author believes that this is an excellent technique for treatment of selected cases from private practice, as well as such institutional cases reported by others.

Studies of the psychoneurotic group are of particular interest and indicate another method of management of a very common and difficult problem.

Results in those patients operated for relief of intractable pain and suffering suggest that this procedure is effective and among the least drastic of surgical measures.

Several patients who had secondary dependency on narcotics, barbiturates, and alcoholic beverages obtained relief from these dependencies along with relief from the underlying disorders and none showed any withdrawal symptoms.

(Author's Abstr.)

Clinical Evaluation of Pacatal

1. Pacatal is capable of eliciting therapeutic responses in chronically psychotic patients.
2. It is most efficacious for those aspects of behaviour which are related to increased anxiety and least efficacious for judgment, insight, orientation, memory and affect.
3. The clinically significant side-effects are those related to the atropine-like action of Pacatal. Untreated eye complications, following prolonged administration of Pacatal, may lead to ulceration of the corneal epithelium.
4. It is recommended that any prolonged ocular disturbance as a result of Pacatal medication be treated with Neostigmine.
5. All the side-effects produced by Pacatal can be obliterated by symptomatic medication, lowering of daily dosage or discontinuation of the medication.
6. The results obtained with Pacatal are encouraging and warrant further investigation upon a prognostically better group of psychotic patients.

(Author's Abstr.)

SEPTEMBER

The Evaluation of the Effects of Derivatives of Rauwolfia in the Treatment of Schizophrenia. *Malamud, W., et al.* 193
A Biochemical Evaluation of the Activity of Certain Tranquilizers and Their Relationship to Hormonal Function. *Gordon, M., et al.* 201
The Physiologic Basis of the Manic Depressive Illness: A Theory. *Kraines, S. H.* .. 206
Studies in Human Ecology. *Hinkle, L. E., Jr., et al.* 212
*Some Interrelations of Social Factors and Clinical Diagnosis in Attempted Suicide: A Study of 109 Patients. *Robins, E., et al.* 221
Bromide Intoxication and Quantitative Determination in Serum. *Tillim, S. J.* .. 232
Two-Year Fate Study of Thorazine-Treated Patients. *Feldman, P. E.* 237
The Intrafamilial Environment of Schizophrenic Patients: II. Marital Schism and Marital Skew. *Lidz, T., et al.* 241
The Physician and Testamentary Capacity. *Usdin, G. L.* 249
Use of Miltown (Meprobamate) with Psychotic Patients. *Pennington, V. M.* 257

Some Interrelations of Social Factors and Clinical Diagnosis in Attempted Suicide: A Study of 109 Patients

1. A study has been reported of social factors in the suicide attempts of 109 patients brought to a general hospital immediately after having made a suicide attempt.
2. Patients with chronic alcoholism, conversion reaction, and sociopathic personality reported a much higher frequency of social difficulties, such as marital friction, divorce, job instability, and financial dependency, than did patients with manic-depressive psychosis and chronic brain syndromes. They not only were involved in more social difficulties at the time they made the suicide attempt, but also reported more such difficulties throughout their lives.
3. Just before the manic-depressive and chronic brain syndrome patients attempted suicide they were disturbed by feelings of depression, self-disgust, and worthlessness, but seldom by feelings of anger or spite towards other persons or by feelings of frustration or neglect caused by others, while the patients in the other 3 diagnostic groups showed the opposite pattern.
4. There were probably no psychiatrically well patients and probably no patients with an anxiety reaction (anxiety neurosis) in the entire group of 109 patients who had made a suicide attempt.
5. The interrelationships of social difficulties, diagnosis, and suicide attempt, based on the findings of this study, were discussed.

(Authors' Abstr.)

OCTOBER

Fellowship Lecture: Eugen Bleuler and Present-Day Psychiatry. *Zilboorg, G.* 289
Response to Fellowship Lecture on Eugen Bleuler. *Krapf, E. E.* 299
Murder by Adolescents with Obscure Motivation. *Stearns, A. W.* 303
The Unlocking of Wards in Mental Hospitals. *Hurst, L. C.* 306

A Study of the Effects of L.S.D.: Physiologic and Psychological Changes and Their Interrelations. *DiMascio, A., et al.* 309
Therapeutic and Toxic Effects of Chlorpromazine Among 3,014 Hospitalized Cases. *Cares, R., et al.* 318
The Antidotal Action of Sodium Succinate in the Mescaline Psychosis. *Stevenson, I., and Sanchez, A. J.* 328
The Place of Reserpine in the Treatment of the Chronic Psychotic Patient. *Gore, C. P., et al.* 333
Chronic Psychosis Following Epilepsy. *Bartlet, J. E. A.* 338
A Study of the Transfer of Long-Hospitalized Patients to a Convalescent Service. *Philips, F., and May, S. B.* 344
Effective Utilization of Electric Convulsive Treatment. *Regan, P. F.* 351
Sensory Deprivation. A Review. *Solomon, P., et al.* 357

NOVEMBER

Psychiatric Nosology: From Hippocrates to Kraepelin. *Veith, I.* 385
The Threat of Clarity. *Hardin, G.* 392
Logical Analysis. *Reid, J. R.* 397
The Problem of Psychiatric Nosology: A Contribution to a Situational Analysis of Psychiatric Operations. *Szasz, T. S.* 405
Psychiatry in Post-War Germany. *Ehrhardt, H.* 414
An English View of American Psychiatry. *Shepherd, M.* 417
Correction and Retribution in the Criminal Law. *Friedman, L.* 421
Reply to Dr. Friedman. *Board, R. G.* 424
Some Psychiatric Notes on the *Andrea Doria* Disaster. *Friedman, P., and Linn, L.* 426
Group Psychotherapy: Individual and Cultural Dynamics in a Group Process. *Opler, M. K.* 433
Normal Deviations From Reality. *Bowman, C. C.* 439
Relationship Between Social Attitudes Toward Aging and the Delinquencies of Youth. *Linden, M. E.* 444
Follow-Up Study on Thorazine Treated Patients. *Kris, E. B., and Carmichael, D. M.* 449
Results of Four Years Active Therapy for Chronic Mental Patients and the Value of an Individual Maintenance Dose of E.C.T. *Wolff, G. E.* 453
Psychophysiological Gastrointestinal Reactions. *Lascara, V. E.* 457

VOL. 11 AM. J. PSYCHOTHER. JULY, 1957

Better Mental Health. *Overholser, W.* 528
The Double Methodology in the Study of Personality and its Disorders. *Arieti, S.* 532
A Midcentury Assessment of Freud's Theory. *Galdston, I.* 548
Explorations in Latent Schizophrenia. *Wolman, B.* 560
Incentives for Treatment Related to Remaining or Improving in Psychotherapy. *Gliedman, L. H., et al.* 589
Modes of Communication in the Psychotherapeutic Process. *Kerdman, L., and Peek, J. E.* 599
The Use of Group Co-Therapists in the Teaching of Psychotherapy. *Gans, R. W.* 618
Psychotherapy for the Dying. *Rosenthal, H. R.* 626
Selection of Patients for Group Psychotherapy. *Leopold, H.* 634
Case Reports. *Thomas, T. H.* 638

VOL. 115 ANN. MED.-PSYCHOL. APRIL, 1957

Limits of the Present Conception of Pick's Disease. *Delay, J., et al.* 609
The Miracle of Saint Epine of Port-Royal. *Targowla, R., and M.* 635
The Proof of Induced Hyperglycaemia. *Pnech, J., and Robin, C.* 659

MAY

A Formula for Re-education. *Parrot, P., and Gueneau, Mlle.* 801
Pneumoencephalography in Dementia Praecox. *Manceaux, A., et al.* 828
Morbid Passion, Imagination and Anomalies of Conduct. *Morin, J., and Ravaud, G.* 837
The Myoclonic Response to Intermittent Light Stimulation in Psychiatry. *Bonnet, H., and H.* 865

JUNE

An Essay on the Neuro-psycho-physiological Conceptions of the Development of Dementia Praecox or Schizophrenia in Relation to Acrodynia. *Abely, P.* 7
The Infant, Innocent Victim. *Chatagnon, C., et al.* 35
On the Validity of the Multiphasic Inventory of Personality of Minnesota. *Delay, J., et al.* 90

JULY

New Researches on the Importance Played by the Psycho-galvanic Reflex. *Copelman, L.-S.* 225
Acute Psychoses and Schizophrenic Evolution During 1930–1956. *Ey, H., et al.* 231

The Anxiety of Self-depreciation in the Adolescent Delinquent. *Parrot, P., and Gueneau, Mlle.* 241
The Chemical Study of the Constituents of Cerebral Tissue During the Nineteenth Century. *Chatagnon, C., and P.* 256

OCTOBER

Fractional Encephalography in the Schizophrenic Syndromes. *Borenstein, P., et al.* .. 385
The EEG of Chronic Alcoholics. *Delay, J., et al.* 427
The Delimitation of Paranoia from Paraphrenia and Schizophrenia. *Bilkiewicz, P., et al.* 441

NOVEMBER

Dementia Praecox, a Process of Schizophreniform Type. *Baruk, H.* 625
The Neuroses. *Lôo, P., et al.* 663
The Probable Influence of Old Age and of Sleep on Epileptic Fits. *Sal y Rosas, F.* .. 706
Attempts at Suicide with Chlorpromazine. *Varenne, G., and Remouchamps, A.* .. 723

ARCH. PSICOL. NEUR. PSICHIAT. 1957

Mechanism and Repetitive Rhythm in Psychology and in Psychiatry. *Callieri, B., and Rigotti, S.* 107
Psychoses with Sympathetico-mimetic Amines. *Tolentino, I., and D'Arossa, B.* .. 127
Variations of Apparent Reality of the Third Dimension in Visual Perception. *Michotte, A.* 203
The Fundamental Psychology of Interview and its Use in Psychology. *Ancona, L.* .. 215
The Rorschach Test in Normal Italian Adults. *De Renzi, F., et al.* 279
The Quantitative and Differential Results in the Rorschach Test in Children from Six to Ten Years Old. *Chiari, S.* 323
Treatment with Dimethylamino-n-propyl-phenothiazine. *Amico G.* .. 363

VOL. 78 ARCH. NEUR. PSYCHIAT. AUGUST, 1957

*Chemical and Electrical Stimulation of Hippocampus in Unrestrained Animals. *MacLean, P. D.*
I. Methods and Electroencephalographic Findings 113
II. Behavioral Findings 128
*Posterior Septal, Fornical, and Anterior Thalamic Lesions in the Cat. *Bond, D. D., et al.* 143
Perception Experiments in a Study of Ambivalence. *Tarachow, S., et al.* 167
A Prognostic Indicator of Treatment Failure in Schizophrenia. *Molish, H. B., et al.* .. 177
Objectivity of the Sedation Threshold. *Thorpe, J. G., and Barker, J. C.* 194
Simultaneous Occurrence of Psychotic Episodes in Monozygotic Twins. *Benjamin, H.* 197
Pyrocatechol Amine (Catecholamine) Metabolism and Effects of Electroconvulsive Therapy. *Sourkes, T. L., et al.* 204
Significance of Pre-experimental Studies in the Psychosomatic Laboratory. *Sabshin, M., et al.* 207

Chemical and Electrical Stimulation of Hippocampus in Unrestrained Animals. I. Methods and Electroencephalographic Findings

This study represents one of a series of investigations on the functions of parts of the hippocampus and other structures of the limbic system. The present experiments were performed on cats and focused attention on an intermediate segment of the hippocampus lying between frontal planes A1·5 and A4·5 of Horsley-Clarke co-ordinates.

Reasons are given for employing "cholinergic" as well as electrical stimulation in this particular study. A method is described that allows one to stimulate electrically or chemically the same point in the brain and at the same time to record the electroencephalographic and behavioural changes in unrestrained animals.

Primary consideration is given to the electroencephalographic changes following the application of acetylcholine (with physostigmine), methacholine, and carbachol. Application of these agents in crystalline form militates against their escape from the region in which they are applied and thereby helps to circumvent a complication that occurs with the use of solutions. Such application also provides the most effective means of eliciting pronounced and enduring electroencephalographic changes. Evidence is presented that cerebral tissue greatly restricts the spread of soluble substances in the brain.

The most pronounced EEG changes are seen with carbachol. Two to four minutes after its application rhythmic potentials at about 20 per second appear and are frequently grouped in the form of spindles. Subsequently they increase in amplitude and may occur in long trains. Intermittently background slow rhythmic activity is seen, and at such times the fast potentials tend to group themselves near the peak and on the falling phase of the slow waves. Seven to fifteen minutes after the drug is deposited, high-voltage spikes begin to appear interspersed among the fast oscillatory potentials. Subsequently they may occur almost continuously for periods of 45 to 60 minutes, reaching amplitudes of 1,400 μv to 1,600 μv. After this prolonged discharge, the seizure gradually subsides during the next hour or two, dissipating in the same patterns of activity that characterized its development. As it dies out, slow rhythmic activity becomes the conspicuous feature of the record.

The changes occurring with acetylcholine are in many ways similar to those seen with carbachol, but are much less intense and shorter in duration, seldom lasting more than an hour. Unless acetylcholine is used in conjunction with physostigmine, pronounced and enduring changes are not consistently obtained.

The application of methacholine is characteristically followed by the appearance of persisting slow rhythmic activity with super-imposed fast potentials. In the hippocampus this agent does not elicit the spike potentials seen with the former two drugs. A possible explanation of the difference in the respective seizure patterns is discussed.

When seizure activity is beginning to subside after the application of (1) acetylcholine and physostigmine or (2) carbachol alone, it shows a prolonged recrudescence following an after-discharge elicited by electrical stimulation at the point where the chemicals were applied. A recrudescence also occurs spontaneously when an animal is succumbing to an anesthetic dose of pentobarbital. Possible explanations for these phenomena are considered.

Attention is drawn to the similarity between the seizure activity induced by carbachol and that associated with injury discharges and electrically induced after-discharges. The possibility is suggested that injury and electrical stimulation result in a release of acetylcholine in an amount that temporarily exceeds the capacity of the local cholinesterase to bring about its destruction.

An investigation on the propagation of electrically and chemically induced hippocampal seizures to other cerebral structures is described.

The slow rhythmic activity that occurs in the hippocampus of waking animals under a variety of conditions is discussed in the light of the present experiments.

(Author's Abstr.)

Chemical and Electrical Stimulation of Hippocampus in Unrestrained Animals. II. Behavioural Findings

This paper deals with the behavioural findings following chemical and electrical stimulation of an intermediate segment of the hippocampus in the cat lying between frontal planes A1·5 and A4·5 of Horsley-Clarke co-ordinates. The preceding communication described a method that allows one to carry out such stimulations in unrestrained animals and at the same time record the electroencephalographic changes. In addition to the technical procedure, the electroencephalographic changes accompanying such stimulations were reported.

For reasons given in Part I, chemical stimulation was usually performed with "cholinergic" agents and involved the application of acetycholine (and physostigmine), methacholine, and carbachol in crystalline form.

The behavioural manifestations following application of carbachol to the hippocampus correlate with three stages of the electroencephalographic changes: 1. During the stage of development there are few noteworthy findings. 2. When the seizure reaches its height (stage of culmination), pronounced changes occur and are characterized by the animal's lack of spontaneity of movement, pseudocatatonic manifestations, failure to respond appropriately to various manipulations, under-reactivity to noxious stimuli of moderate intensity, and sudden vacillation between violent activity and statuesque postures subsequent to intense noxious stimulation. Angry behaviour elicited by prolonged noxious stimulation is undirected. Viscerosomatic, postural, and locomotor reflexes are retained. No significant spontaneously occurring autonomic manifestations are evident. 3. During the stage of subsidence the animal manifests enhanced pleasure and grooming reactions and is unusually receptive to genital stimulation. Sustained penile erection may be induced in male cats. If the high-voltage seizure activity associated with Stage 2 fails to develop, these are the only findings.

Except for an apparent enhancement of pleasure and grooming reactions, stimulation with acetylcholine and methacholine was followed by no significant behavioural manifestations that could be correlated with the bio-electrical changes induced by these drugs.

Enhanced pleasure and grooming reactions were observed following 14 of 26 chemical stimulations of the hippocampus. This compared with 2 such positive reactions following 28 stimulations elsewhere. They were not seen when empty needles were placed in the hippocampus. If the results of this exploratory study were subjected to statistical analysis, they would be highly significant.

The foregoing changes in dispositions are in marked contrast to the manifestations that occur if the drugs in question escape from the hippocampus into the overlying ventricle. In this event there results a syndrome characterized by contralateral circling, angry behaviour, and a number of autonomic manifestations.

The changes that can be demonstrated during hippocampal after-discharges elicited by electrical stimulation are in most respects similar to those described in regard to Stage 2 of carbachol-induced seizures. For several minutes following after-discharges a majority of animals showed enhanced pleasure and grooming reactions. In the male partial erections were sometimes noted during grooming in the genital region. A comparative study is presented to show that intensive post-after-discharge grooming is also a common finding in the rat. Here, too, one might note the presence of penile erection.

The foregoing experiments are discussed in the light of a number of problems pertaining to experimental psychology and clinical neurology. Continuing investigation is beginning to suggest that a neural system involving parts of the hippocampus, cingulate gyrus, and septum is implicated in the pleasure and grooming reactions and the sexual manifestations that have been described.

(Author's Abstr.)

Posterior Septal, Fornical, and Anterior Thalamic Lesions in the Cat

A variety of behavioural and vegetative changes were observed in 85 stock cats for periods ranging from 1 to 90 days following relatively small, bilateral, stereotaxically placed lesions in the septum, fornix, and anterior thalamus, which were histologically verified and analyzed. These alterations included impaired consciousness, hypokinesia, muscular plasticity, sustained grasping, the "jump" reflex, piloerection, marked hypothermia, and relatively persistent hyperglycemia, as well as a high incidence of early and late post-operative deaths. Rage reactions were conspicuously not in evidence. These results could not be anatomically correlated with discrete nuclear masses or their specific projections. The highest incidence of abnormality was associated with a combination of posterior septal, fornical and anterior thalamic destruction. Such lesions are so situated as to interrupt major rhinencephalic-hypothalamic and mesencephalic reticulothalamocortical projections, which are thought to account for the observed alterations. Serum sodium, potassium, and magnesium and blood urea nitrogen determinations, before and after the placement of lesions, showed no consistent changes.

(Authors' Abstr.)

SEPTEMBER

Relationship of Blood Glucose to Changes in "Insulin Sensitivity" During Insulin Shock Therapy. *Bennett, I. F., et al.* 221
Pineal Gland Displacement in Acute Cerebrovascular Occlusion. *Drori, J. B., et al.* .. 228
Arteriographic Demonstration of the Collateral Circulation of the Cerebral Hemispheres. *Mount, L. A., and Taveras, J. M.* 235
Effects of Chlorpromazine on Cerebral Circulation and Electroencephalogram in Cats. *Ingvar, D. H., and Soderberg, U.* 254
Experimentally Induced Epilepsy in the Cat with Injury of Cornu Ammonis. *Green, J. D., et al.* 259
Alterations in Mental Function and Paroxysmal Cerebral Activity. *Kooi, K. A., and Hovey, H. B.* 264
Serum Copper and Oxidase Activity in Schizophrenic Patients. *Horwitt, M. K., et al.* 275
Need for a New Subdiscipline in the Medical Profession. *Kubie, L. S.* 283
Reliability of Epinephrine-Methacholine (Mecholyl) Testing. *Sloane, R. B., et al.* .. 294
Depressive and Paranoid Reactions. *Orbach, C. E., and Bieber, I.* 301
*Adrenocortical Response and Phosphate Excretion in Schizophrenia. *Stevenson, J. A. F., et al.* 312
Effects of Lysergic Acid Diethylamide (LSD) on the Time Sense of Normals. *Boardman, W. K., et al.* 321

Adrenocortical Response and Phosphate Excretion in Schizophrenia

The variations in several indices of adrenocortical activity have been measured in 20 hospital orderlies, 18 catatonic schizophrenics, and 21 paranoid schizophrenics throughout a control morning (7.0 a.m.–12.15 p.m.) and other mornings before and after the administration at 9.0 a.m. of corticotropin (25 mg. i.m.) or of epinephrine (0·3 mg. s.c.).

During the control periods the catatonics excreted less ($P<0\cdot01$) phosphate than did the normals or the paranoids and more ($P<0\cdot05$) 17-ketosteroids than the normals. Both schizophrenic groups excreted more ($P<0\cdot05$) sodium than the normals; their urine volume also tended to be greater.

Both schizophrenic groups increased their excretion of phosphate as the morning progressed, but the normals maintained a relatively stable rate. After both corticotropin and epinephrine the excretion of phosphate was higher in the schizophrenics than in the normals, but when the spontaneous rate observed on the control day is substracted from that observed after corticotropin the net effect of this agent appears to be a retention of phosphate.

As previously reported, the resting level of circulating eosinophils was lower and the response to corticotropin greater in the catatonics than in the normals or the paranoids.

These results support the suggestion that catatonic and paranoid schizophrenics differ as much from one another as they do from normals and suggest that the phosphate metabolism in this disease is worth intensive study.

(Authors' Abstr.)

OCTOBER

Predictability of the Electroencephalogram in People with Seizures. *Renfrew, S., et al.* 329
Spinal Reflex Activity from the Vesical Mucosa in Paraplegic Patients. *Bors, E. H., and Blinn, K. A.* 339
Vasocardiac Effects of the Circle of Willis. *Pool, J. L.* 355

Changes in the Blood-Brain Barrier After Exposure of the Brain. *Samorajski, T., and Moody, R. A.* 369
Effect of High-Intensity Focused Ultrasound on Nerve Cells in Spinal Cord of Mouse. *Bowsher, D.* 377
Fear of Electroconvulsive Therapy. *Friedman, M. H.* 385
Comparative Lucid Intervals After Amobarbital, CO_2, and Arecoline in the Chronic Schizophrenic. *Fulcher, J. H., jr., et al.* 392
Epinephrine and Arterenol (Norepinephrine) in Mental Disease. *Manger, W. M., et al.* 396
Psychoanalytic Theories of Activity-Passivity Conflicts and of the Continuum of Ego Defenses. *Sarwer-Foner, G. J.* 413
Treatment of Chronic Schizophrenia with Promazine Hydrochloride. *Sibilio, J. P., et al.* 419
Visual Discrimination and the Decision Process in Anxiety. *Korchin, S. J., et al.* .. 425

VOL. 80 BRAIN SEPTEMBER, 1957

Rathke-Pouch Tumours. *Northfield, D. W. C.* 293
Symmetrical Calcification of the Basal Ganglia with Familial Ataxia and Pigmentary Macular Degeneration. *Strobos, R. R. J., et al.* 313
Arthrogryposis Multiplex due to Congenital Muscular Dystrophy. *Banker, B. Q., et al.* 319
A Further Study of Visual-Spatial Agnosia. *Ettlinger, G., et al.* 335
The Phosphorus Metabolism of Gliomas: A Study with Radioactive Isotopes. *Selverstone, B., and Moulton, M. J.* 362
Is There a Pyramidal Tract? *Bucy, P. C.* 376
Brain Mechanisms and Logic. *Smythies, J. R.* 393
Sir Charles Sherrington, Poet and Philosopher. *Penfield, W.* 402

VOL. 8 BR. J. DELINQ. OCTOBER, 1957

Depression and Crime. *Woddis, G. M.* 85
Borstal Allocation. *Morrison, R. L.* 95
Treatment of the Adolescent Offender. *Wardrop, K. R. H.* 106
Magisterial Policy in the London Juvenile Courts. Part II. *Mannheim, H., et al.* .. 119

VOL. 27 BR. J. EDUC. PSYCHOL. NOVEMBER, 1957

Symposium: Contributions to Intelligence Testing and the Theory of Intelligence:
I.—On Defining Intelligence. *Miles, T. R.* 153
II.—Nature-Nurture Balance Sheets. *Maddox, H.* 166
III.—A Study of Cognitive Error Through an Analysis of Intelligence Test Errors. *Lawrence, P. J.* 176
IV.—Intelligence and Age: Retesting with Twenty-four Years' Interval. *Nisbet, J. D.* 190
V.—An Experiment on Practice, Coaching and Discussion of Errors in Mental Testing. *Heim, A. W., and Watts, K. P.* 199
Variability in Attainment. *Kemp, L. C. D.* 211

VOL. 30 BR. J. MED. PSYCHOL. 1957

The Ailment. *Main. T. F.* 129
An Experimental Approach to the Psychopathology of Childhood: Encopresis. *Anthony, E. J.* 146
The Relevance of Genetic Psychology for the Psychopathology of Schizophrenia. *Freeman, T., and McGhie, A.* 176
Reminiscence and Work Decrement in Catatonic and Paranoid Schizophrenics. *O'Connor, N.* 188
Environmental Influence on Intellectual Function as Measured by Intelligence Tests. *Mundy, L.* 194
Joint-Interview Technique: An Experiment in Group Therapy. *Liebermann, L. P.* .. 202

DECEMBER

The Future of "Dynamic" Psychology. *Glover, E.* 219
Symposium on the Contribution of Current Theories to an Understanding of Child Development:
I. An Ethological Approach to Research in Child Development. *Bowlby, J.* 230
II. Contributions of Associative Learning Theory to an Understanding of Child Development. *Hindley, C. B.* 241
III. The Contributions of Psychoanalysis to the Understanding of Child Development. *De Monchaux, C.* 250
IV. The System Makers: Piaget and Freud. *Anthony, J.* 255
The Validity of a Psychological Test of Brain-Damage. *Walton, D., and Black, D. A.* 270

VOL. 48 BR. J. PSYCHOL. AUGUST, 1957

The Distribution of Intelligence. *Burt, C.* 161
Corrigendum 175

On the Validity of Applying Communication Theory to Experimental Psychology. *Cherry, E. C.* 176
On Some Psychophysical Techniques Employing a single Manipulandum. *Weiskrantz, L.* 189
Perceptual and Personality Dynamics in Reactions to Ambiguity. *Hamilton, V.* 200
Frequency, Recency, Association Value and Tachistoscopic Identification. *Leytham, G. W. H.* 216
The Prediction of Examination Marks of Mechanical Engineering Students at King's College, Newcastle. *Garside, R. F.* 219
Shape Recognition in Rats. *Dodwell, P. C.* 221

NOVEMBER

Individual Differences in Intentional and Incidental Learning. *Plenderleith, M., and Postman, L.* 241
Rubella Deaf Children: A Rorschach Study Employing Munroe Inspection Technique. *Bindon, D. M.* 249
Previous Knowledge and Memory. *Poulton, E. C.* 259
Measures of Subjective Probability. *Cohen, J., et al.* 271
The Qualitative Investigation of Intelligence. *McColskey, A. S.* 276
The Solving of Three-Term Series Problems. *Hunter, I. M. L.* 286
The Influence of Extraneous Stimulation on the Reaction Time of Schizophrenics. *Tizard, J., and Venables, P. H.* 299
The Boundaries Between the Person and the World: A Note on the Paper by Gardner Murphy. *Litwinski, L.* 306

VOL. 22 BULL. LOS ANGELES NEUR. SOC. SEPTEMBER, 1957

Protein Content in the Cerebrospinal Fluid of Diabetic Patients. *Ives, E. R.* 95
The Electromyogram in Compensatory Muscular Syndromes Accompanying Peripheral Nerve Lesions. *Marinacci, A. A.* 112
The Pathogenesis of Nodular Cortical Atrophy. Apparent Mechanism of Lesion Commonly Found in Cerebral Palsied Individuals. *Courville, C. B.* 120
Psychiatric Symptoms and the Limbic Lobe. *Malamud, N.* 131
Prosopagnosia. *Nielsen, J. M.* 140

VOL. 33 CERVELLO MAY, 1957

Histological Aspects in Senile Psychoses. *Fattovich, G.* 157
Imaginary Pregnancy. *Burruano, F.* 177
The Central Action of *Rauwolfia serpentina* on the Connection Between the Midbrain and the Retina. *Buondonno, E.* 193
The Relation Between Nocturnal Enuresis and Epilepsy. *Maria, G.* 219

JULY

A Contribution to the Pathological Anatomy of Mongoloid Idiocy. *Fattovich, G.* 241
Alcoholism in the Province of Cremona. *Bonetti, U.* 263
A Statistical Study on the Behaviour of the Menstrual Flow during E.C.T. *Micheletti, V., et al.* 287
A Clinical Study of Familial Psychoses. *Sagripanti, P., and Marcellini, D.* 297
Chronic Lead Poisoning and Neuropsychiatric Disturbance. *Carpitella, A.* 309
Encephaloporosis. *Fattovich, G.* 321
Basal Metabolism and Stress in Psychoneurotics Before and After Treatment. *Meucci, M.* 341
Diplegia of the Facial Nerve of Traumatic Origin. *Quarti, G., and Serini, G.* 353
Ammonia, Creatine Compounds and Inorganic Phosphorus in the Blood of Muscles in a State of Pyramidal Hypertonia. *Leoni, G.* 361
Pathogenetic Considerations about Hypoglycemia and Hyperinsulinism, Epilepsy and Mental Enfeeblement. *Miglio, G., and Zampori, O.* 373

NOVEMBER

Histopathological Aspects of a Case of Infantile Encephalopathy. *Fattovich, G.* 401
Histochemical Studies on Modifications in the Nucleinic Acid, etc. in the Nervous System. *Burruano, F.* 417
Biological Research in Schizophrenia. *Polimanti, E., and Buondonno, E.* 433
Erotic Paroxysms in Neuropsychopathic Conditions. *Adamo, M.* 455

VOL. 18 DIS. NERV. SYST. JULY, 1957

The Physician in the Role of Psychotherapist. *Ziskind, E.* 249
*Galactose Treatment of Multiple Sclerosis. *Hartstein, J., and Ulett, G. A.* 255
Therapeutic Trial of Chlorpromazine in Patients with Chronic Mental Illness. *Klotz, M., and Thompson, H. B.* 259
*Evaluation of Transorbital Lobotomy with a Control Group. *Hoerster, S. A., jr., and Jaco, E. G.* 263

Subconvulsive Electrotherapy in Mental Disorders. *Olkon, D. M.* 271
Humoral Arousal Responses in Mental Disease. *Wilson, W. P., and Parker, J. B.* .. 272
The Use of Reserpine (Serpasil) in Mentally Ill Epileptics. *Brooks, C.* 275

Galactose Treatment of Multiple Sclerosis

These initial observations are far from conclusive and the literature is replete with new treatments for multiple sclerosis which seemed promising only in the first report. As Schumacher (1950) has pointed out the validation of any treatment for this illness must be conducted over a period of several years. Such long term evaluation of galactose treatment is now planned, but it was hoped that a preliminary report of this work might stimulate other workers to make observations upon the method. With such reservations, however, we can state that the clinical findings suggest that a treatment regime involving administration of galactose is effective in reversing some of the symptoms of multiple sclerosis. One would suspect that only early or incomplete lesions would be most likely to reverse with such treatment. The sugar must be continually given to maintain the gains achieved. Failure to maintain improvement with oral administration, together with observation of blood galactose levels now in progress, would suggest that multiple sclerosis patients have a defect in galactose metabolism, and that such a defect may be concerned with the manner in which galactose is absorbed from the alimentary tract.

(Authors' Abstr.)

Evaluation of Transorbital Lobotomy with a Control Group

In terms of the measurements and indices used in this study, transorbital lobotomy was significantly more effective in relieving psychiatric disturbances and in enabling "backward" psychotic patients in a state hospital to be released from hospital than patients in a similar psychotic state receiving other somatic forms of treatment. In view of the poor prognosis of these patients and their long length of hospitalization, these results seem especially remarkable in favour of this mode of treatment for psychotic patients who are refractory to typical somatic therapies.

(Authors' Abstr.)

AUGUST

Constitutional Aspects in Psychiatry of Poor Readers. *Barger, W. C., et al.* 289
Results of Lobotomy Operations. *Niswander, G. D., et al.* 294
Psychiatric Services in a Pediatric Hospital. *Chapman, A. H., et al.* 296
*Effect of Perphenazine (Trilafon) on Modification of Crude Consciousness. *Mason-Browne, N. L., and Borthwick, J. W.* 300
Non-Thrombocytopenic Purpura in Chlorpromazine Therapy. *Childers, R. T., jr.* .. 307
"Like Charity, Mental Hygiene Begins at Home." *Mueller, E. E., et al.* 308
Eastern Psychiatric Research Association 314

Effect of Perphenazine (Trilafon) on Modification of Crude Consciousness

A double blind study has been carried out on 75 chronic male and female patients, divided into three equal groups of 25. The three groups received perphenazine 16 mg. t.i.d., placebo 16 mg. t.i.d., and chlorpromazine 25 mg. t.i.d. respectively for 30 days.

Patients were rated and tested before and after the trial. In addition, laboratory investigations were made at those times and preliminary, daily, and final clinical assessments were made.

Additional seven female patients were given either perphenazine or placebo in the same dosage for the same period. These seven were not tested but all had failed previously to respond to large doses of chlorpromazine.

Statistical procedures included analysis of variance and t tests of significance. The Rating Scale for anxiety and the Tapping and Dotting tests were found to be significant at the 1 per cent. and 5 per cent. levels respectively for the perphenazine group. Digit Symbol, Porteus Maze and Digit Span did not show significant differences. The significance of these differences was discussed.

Rating, testing, and clinical assessment all showed perphenazine to be similar in its actions to chlorpromazine, but with the advantage of greater efficacy and of a much more favourable therapeutic ratio. Side effects similar to chlorpromazine were found, but it is thought would be less likely to occur in smaller dosage. Hypotension was not encountered.

The preliminary findings concluded that perphenazine is likely to prove a more than useful weapon in psychiatric practice, with indications for use, and with side effects similar to those of chlorpromazine, but with greater potency and improved therapeutic ratio.

(Authors' Abstr.)

SEPTEMBER

Current Trends in Psychiatric Education. *Moore, F. J.* 329
Combined Use of Psychotherapy with Ataraxic Drugs. *Lesse, S.* 334
Pharmacological Agents in Study of Higher Nervous Activity. *Gantt, W. H.* 339
Theoretical Considerations in the Therapeutic Use of Peripheral Electrical Stimulation in Psychiatry. *Jones, C. H., and Shanklin, J. G.* 342

Evaluation of Meprobamate (Miltown) in Treatment of Hospitalized Schizophrenic Patients. *Laird, D. M., et al.* 346
A Contribution to the Psychology of the Snob. *Bergler, E.* 352

OCTOBER

A Re-Examination of Mental Illness in Old Age. *Williams, W. S., and Jaco, E. G.* .. 375
Group Psychotherapy in a General Hospital. *Hadden, S. B.* 379
Therapeutic-Team Approach to Modified E.S.T. *Andren, H. E., and Dick, D. R.* .. 383
Evaluation of Treatment Procedures in Psychiatry. *Smith, J. A., and Wittson, C. L.* .. 387
Ineffectiveness of Chlorpromazine and Rauwolfia Serpentina Preparations in the Treatment of Depression. *Gahagan, L. H.* 390
Treatment of Ambulatory and Hospitalized Psychiatric Patients With Trilafon. *Ayd, F. J., jr.* 394
Historical Considerations in Psychiatry. *Harms, E.* 397

NOVEMBER

Peripheral Neuropathy Associated With Multiple Myelomatosis and Amyloidosis. *Dumas, L. W., et al.* 419
Reactivity of Brain Tissue to Intracranial and External Electrotherapy. *Negrin, J., jr.* 425
*Prochlorperazine (Compazine) in Emotional Disturbances. *McAfoos, L. G., jr.* .. 430
*Dimethylane in the Treatment of Anxiety Reactions. *Weiss, J. M. A., et al.* 434
Electroshock Therapy Without Muscle Relaxants. *Radzinski, J. M.* 439
Preliminary Report on Cytopathology of Erythrocytes of Schizophrenic Patients. *Ansley, H. R., et al.* 444

Prochlorperazine (Compazine) in Emotional Disturbances

Prochlorperazine was used to complement supportive therapy in 52 psychoneurotic patients and found effective for relieving symptoms of anxiety, tension, and apprehension. On a dose of 5 mg., three to four times daily, 17 obtained an excellent clinical response; 22, good; 5, fair; and 8, poor. A single dose of the drug in sustained release (Spansule capsules) form provided an effect that lasted approximately twelve hours. Patients on the drug regained the ability to relax, sleep better, and adjust more efficiently to disturbing environmental factors. Four of 5 patients on the verge of hospitalization responded adequately, becoming amenable to supportive psychotherapy on an ambulatory basis. Three patients reported side effects, one each of drowsiness, dizziness and stomatitis. No jaundice, blood dyscrasias, or skin reactions occurred in the nine months the study required.

(Author's Abstr.)

Dimethylane in the Treatment of Anxiety Reactions

This study reports an investigation and evaluation of the usefulness of a comparatively new drug, Dimethylane (2,2-diisopropyl-4-hydroxymethyl-1, 3-dioxolane), in the control of anxiety and tension states. A rigidly controlled "double blind" method of investigation was used. Thirty patients with a primary diagnosis of "anxiety reaction" were carefully selected according to defined criteria. Half of the patients were given drug capsules for two weeks and then placebo capsules for two weeks, and for the other half the order was reversed. The capsules were identical and elaborate precautions were taken to make certain that neither the patient nor anyone in contact with him knew whether the patient was receiving drug or placebo. Evaluations on quantifiable scales of any change in frequency or severity of symptoms were made by both patients and examiners.

Patients generally demonstrated slight improvement, whether given Dimethylane or placebo. Contrary to the conclusions of some previous studies, most of which did not use control groups, no significant differences were found in the effects of the drug as compared to those of the placebo. In the authors' series there were no adverse side effects which could be clearly attributed to the drug.

The final impression was that Dimethylane is of little clinical value in providing symptomatic relief for patients suffering from generalized anxiety reactions, but that further investigation of this drug in the control of symptoms associated with such specific conditions as primary dysmenorrhoea and post-alcoholic psychomotor agitation seems warranted.

(Authors' Abstr.)

MONOGRAPH

*Stress Conditioning in the Treatment of Schizophrenia and Neurotic Disorders. *Conason, E. G., and Ryberg, P. E.* 8
*Localized Electric Stimulation of the Diencephalon in the Treatment of Mental Disorders. *Breitner, C.* 14
Combined Use of Metrazol and Succinylcholine in the Therapy of Mental Disorders. *Komora, E. J., and Padula, L. J.* 21
Management of Fear in Electroshock Therapy. *Gallinek, A.* 26
Normal and Abnormal Adaptations—Homeostasis, Schizokinesis and Autokinesis. *Gantt, W. H.* 30

Prevention of Fatalities in Electroshock Therapy. *Impastato, D. J.*	34
Treatment of Chlorpromazine-Diethazine in Depression. *Denber, H. C. B.*	76
Studies on Perceptual Isolation. *Azima, H., and Cramer-Azima, F. J.*	80
The Effectiveness of Several Forms of Electrocerebral Stimulation in the Treatment of Hard Core Cases. *Campden-Main, B. C.*	87
Biochemical Aspects of Certain Forms of Mental Deficiency. *Jervis, G. A.*	93

SEMINAR IN ELECTROSHOCK THERAPY

Practice of Electroshock Therapy. *Holt, W. L., jr.*	97
Electroconvulsive Therapy. *Friedman, E.*	99
Electrosleep Therapy in Psychoses. *Buckman, C., et al.*	106
Acute Complications in Electroshock Therapy (the Emergency Tray). *Impastato, D. J.*	109
Role of the Anesthesiologist in Electroconvulsive Therapy. *Padula, L. J.*	112

Stress Conditioning in the Treatment of Schizophrenia and Neurotic Disorders

The authors have presented a report on the treatment of 98 patients diagnosed as schizophrenics and other disorders. Treatment consisted of stress conditioning or acclimatization to stress by a process similar to that operating in allergic desensitization.

Their procedure is to inject intramuscularly 3·0 c.c. of adrenal cortical extract for 12 days in order to rest the adrenal cortical gland which they assume to be overdriven even to the point of exhaustion in some cases. This is followed by a series of antigenic protein injections at weekly intervals beginning with a sub-reactive dose and progressively increasing it so that the patient becomes conditioned gradually to stresses.

(Authors' Abstr.)

Localized Electric Stimulation of the Diencephalon in the Treatment of Mental Disorders

Electric shock treatment is known to be of value in certain mental disorders, but has inherent physical hazards and adverse side effects, such as confusion, increased anxiety and memory loss. There are indications that diffuse stimulation of the entire brain with convulsion-producing currents is not always necessary for the attainment of results, and that therapeutic effects may be obtained by discrete stimulation of certain brain areas, particularly of the diencephalon. Conventional techniques make such discrete stimulation of specific brain areas difficult or impossible

A method of non-convulsive electric stimulation is suggested in which comparatively high concentration of current in the diencephalon may be obtained, while stimulation of other brain areas, including the motor cortex, is kept at a minimum. In this procedure specially designed electrodes are used. One of these is placed centrally at the base of the skull. Treatment results so far have been most encouraging. No adverse side effects have been observed.

(Author's Abstr.)

VOL. 46 **ENCEPHALE.** 1957

Suicide Amongst Epileptics. *Delay, J., et al.*	401
Observations on Aphasia. *Riese, W.*	437
The Etiology of Mongolism. The Role of Enzymatic Inhibitors. *Rapaport, I.*	468

VOL. 60 **FOL. PSYCHIAT. NEUR. NEUROCHIR. NEERL.** APRIL, 1957

Foetal Craniostenosis and Cortical Development. *Biemond, A.*	81
Clinical Aspects of Optic Nerve Compression. *Meadows, S. P.*	86
Some Metabolic Aspects of Myotonia Dystrophica. *Kemp, A.*	88
Infectious Encephalomyelopathy with Adenitis. *Dimsdale, H.*	96
Observations on the Lateral Column of the Human Cervical Cord. *Smith, M. C.*	102
Asemiotic Disorders. *Grewel, F.*	103
Sensory Neuropathy in Diabetes Mellitus. *Bosanquet, F. D., and Henson, R. A.*	107
The Significance of the EEG for the Diagnosis and Localization of Cerebral Tumours. *Magnus, O., and Drift, J. H. A. v. d.*	118
Acceleration in Human Limbs During Voluntary Movement. *Marshall, J.*	126
"Ambivalent" Optokinetic Stimulation. *Braak, J. W. G. ter*	131
The Classification of Gliomata on the Basis of the Pathogenesis. *Stam, F. C.*	136
A Family with Dystrophia Myotonica. *Jefferson, M.*	141
Histopathology of EEG Foci in Epileptics. *Kramer, W.*	145

JUNE

Ascending Fibre Systems in the Antero-lateral Funiculus of the Human Spinal Cord. *Verhaart, W. J. C., and Giok, S. P.*	159
The Marks on the Skin in Some Phacomatoses. *Wulfften Palthe, P. M.*	173
Diagnostic and Therapeutic Value of Creative Activities in the Mental Hospital. *Vaessen, M. L. J.*	187
A Method of Movement-Analysis with Psychiatric Patients. *Roozendaal, N. P. van*	205
Pneumo-encephalography in Cerebral Infarction. *Moffie, D.*	219

Two Cases of Absence of the Septum Pellucidum in the Pneumoencephalogram. *Vinken, P. J., and Strackee-Kuijer* 226

VOL. 55 GENET. PSYCHOL. MONOGR. MAY, 1957

The Structure and Origin of the Anal Character. *Beloff, H.* 141
Free Expression of Adolescents' Interests. *Amatora, M.* 173
The Role of Mass Media and the Effect of Aggressive Film Content Upon Children's Aggressive Responses and Identification Choices. *Albert, R. S.* 221
Interest in Persons as an Aspect of Sex Difference in the Early Years. *Goodenough, E. W.* 287

VOL. 56 AUGUST, 1957

Some Stable Response Determinants of Perception, Thinking, and Learning: A Study Based on the Analysis of a Single Test. *Simmel, M. L., and Counts, S.* 3
Potentials of Age: An Exploratory Field Study. *Pressey, S. L.* 159

NOVEMBER

Tactile Communication. *Frank, L. K.* 209
The Use of a Filmed Puppet Show as a Group Projective Technique for Children. *Haworth, M. R.* 257
The Social Competence of Middle-Aged People. *Havighurst, R. J.* 297

VOL. 85 GIORN. PSICHIAT. NEUROPAT. 1957

The Pathogenesis of the Syndrome of Guillain-Barré-Strohl. *Scarzella, R.* 1
Vertebral Echinococcosis. *Pagni, C. A.* 55
Pneumoencephalography as a Biological Test of the Hypothalamic Functions. *Cavalca, G. G., and Reggiani, R.* 67
A Contribution to the Study of Rosenthal Fibres. *Crosato, F.* 107
A New Technique for Exploring the Activity of Coagulation of the Cerebrospinal Fluid. *Bovi, A.* 123
Carbutamide and Glucose Metabolism. *Bambini, G., and Sanguinelli, A.* 137
The Pre-Illness Personality of the Alcoholic. *Maroncelli, P.* 151
A Case of Acute Confusional Syndrome of Korsakoff Type. *De Maio, D., and Maddedu, A.* 171
Electrophoretic Fractioning of Aqueous Extracts of Cerebral Tissue. *Bobuschi, L., and Benassi, G.* 182
The Anaesthesia of the Sinus-glomocarotid Region as a Therapeutic Measure. *Tronconi, V., and Romerio, C.* 267
A Case of Primitive Cerebellar Atrophy. *Fattovich, G.* 271
Recent Anatomo-physiological Knowledge of Rhinencephalic Structures with Clinical Picture of Temporal Epilepsy. *Alvisi, C., and Ballerini, A.* 297
Clinical-angiographic Study of Arterio-venous Malformations of the Brain. *Mironi, F.* 363
The Meaning of "Light Dark" Answers. *Basaglia, F., and Dalla Banba, G.* 391
Action of 2-methyl-2-n-propil-1-3-propanediol dicarbamate on the Rabbit. *Montanini, R., and Terranova, R.* 401
Remote Control of the Time of Circulation in Thrombosis of the Carotid on the Neck. *Campailla, G., and Toti, A.* 485
Remarks on the Effects of 5-HT on the Central Nervous System. *Ferro-Milone, F., and Gomirato, G.* 519
Spinal Arachnoiditis. *Bertini, F., and Scarzella, R.* 535
Hepatic Coma. *Zappi, F.* 559
Parameters of Single Muscular Action Potential in Infectious Polyneuritis. *Barizzi, L., and Broglia, S.* 571
EEG Study of Hemicrania. *Masciocchi, A., and Saroldi, F.* 581
Feeling of Strangeness in Melancholia. *Basaglia, F.* 627
Clinical Study of Language Disturbances of Typical Type. *Volterra, V.* 647
Anatomo-histopathological Contribution to the Study of Leucotomy. *Sanguinetti, A., and Miceli, E.* 659
The Paranoid Syndrome within an Anthropological Conception. *Basaglia, F., and Dalla Barba, G.* 671
Some Aspects of Schizophrenic Records. *Basaglia, F., and Dalla Barba, G.* 677

VOL. 38 INT. J. PSYCHO-ANAL. SEPTEMBER-OCTOBER, 1957

The Erotic Instincts—A Contribution to the Study of Instincts. *Ostow, M.* 305
The Precognitive Cultural Ingredients of Schizophrenia. *Moloney, J. C.* 328
The Psycho-Analytic Treatment of Ulcerative Colitis. *Sperling, M.* 341
Two Types of Preoedipal Character Disorders. *Silbermann, I.* 350

VOL. 54 J. AB. SOC. PSYCHOL. MAY, 1957

Interrelations Among Three Criteria of Improvement in Group Therapy: Comfort, Effectiveness, and Self-awareness. *Kelman, H. C., and Parloff, M. B.* 281
Determinants of Conformity and Attitude Change. *Hardy, K. R.* 289

Test-Retest Stability of Interaction Patterns During Interviews Conducted One Week Apart. *Saslow, G., et al.* .. 295
Authoritarian Attitudes and Personality Maladjustment. *Jensen, A. R.* .. 303
Factors Determining the Guessing of Meanings of Foreign Words. *Brackbill, Y., and Little, K. B.* .. 312
Performance on the Bender Under Hypnotic Age Regression. *Crasilneck, H. B., and Michael, C. M.* .. 319
Decision Processes in Communication Nets. *Shaw, M. E., et al.* .. 323
A Cross-Cultural Study of Perceptual Predominance in Binocular Rivalry. *Bagby, J. W.* 331
Psychogenic Deafness and Perceptual Defense. *Kleinman, M. L.* .. 335
Expectancy Changes in Skill and Chance Situations. *Phares, E. J.* .. 339
Sex Differences in Social Memory Tasks. *Witryol, S. L., and Kaess, W. A.* .. 343
Metaphors from Music Criticism. *Brown, R. W., et al.* .. 347
Liking for the Group and the Perceived Merit of the Group's Behavior. *Berkowitz, L.* 353
Studies in the Phenomenology of Emotions. *Block, J.* .. 358
Effects of Biological and Social Motivation on Schizophrenic Reaction Time. *Rosenbaum, G., et al.* .. 364
Conclusion-Drawing, Communicator Credibility, and Anxiety as Factors in Opinion Change. *Fine, B. J.* .. 369
The Role of Experience in Judging Children's Photographs. *Kessen, W.* .. 375
Relationships Between Child Training and the Pictorial Arts. *Barry, H., III* .. 380
The Generality of Accuracy and Response Sets in Interpersonal Perception. *Crow, W. J., and Hammond, K. R.* .. 384
Patterns of Attitudes Toward Child Rearing and the Family. *Schaefer, E. S., and Bell, R. Q.* .. 391
Authoritarian Ideology in Negro College Students. *Steckler, G. A.* .. 396
Personality, Anxiety, and Muscle Tension as Determinants of Response Stereotypy. *Kuethe, J. L., and Eriksen, C. W.* .. 400
Leading and Following Psychotherapeutic Techniques with Hypnotically Induced Repression and Hostility. *Gordon, J. E.* .. 405
The Effects of Personal and Shared Threats Upon Social Prejudice. *Feshbach, S., and Singer, R.* .. 411

VOL. 55 JULY, 1957

Linguistic Determinism and the Part of Speech. *Brown, R. W.* .. 1
A Study of Anxiety in the Sociopathic Personality. *Lykken, D. T.* .. 6
A Study of Affective Responsiveness in a Lie-Detection Situation. *Block, J.* .. 11
The Immediate and Delayed Effect of Failure as a Function of Task Complexity and Personalization of Failure. *Truax, C. B., and Martin, B.* .. 16
Uses of Common Objects as Indicators of Cultural Orientations. *Dennis, W.* .. 21
Authoritarianism, Intolerance of Ambiguity, and Rigidity Under Ego- and Task-Involving Conditions. *Millon, T.* .. 29
Cognitive Complexity and Assimilative Projection in Attitude Change. *Lundy, R. M., and Berkowitz, L.* .. 34
Make-A-Picture Story (MAPS) Test Findings for Rubella Deaf Children. *Bindon, D. M.* 38
Shift in Judgment of Weights as a Function of Anchoring Stimuli and Instructions in Early Schizophrenics and Normals. *Salzinger, K.* .. 43
An Analysis of Interperson Correlations Among Thirty Psychotics. *Williams, R. J., and Machi, V. S.* .. 50
Frequency and Idiosyncrasy of Associative Responses. *Mandler, G., and Parnes, E. W.* 58
The Relation of Ego Control to Overt Aggression and Dependency. *Livson, N., and Mussen, P. H.* .. 66
Attitude Change Through Reward of Verbal Behavior. *Scott, W. A.* .. 72
Identification and Observational Learning from Films. *Maccoby, E. E., and Wilson, W. C.* .. 76
Body-Image Boundaries and Adjustment to Poliomyelitis. *Ware, K. E., et al.* .. 88
The Manifest Anxiety Scale as a Measure of Drive. *Silverman, R. E.* .. 94
The Psychological Meaning of Acquiescence Set for Authoritarianism. *Gage, N. L., et al.* .. 98
Cultural Influence on the Perception of Movement: The Trapezoidal Illusion Among Zulus. *Allport, G. W., and Pettigrew, T. F.* .. 104
A Motivational Factor in Conformity. *Moeller, G., and Applezweig, M. H.* .. 114
Group Learning and Communication as a Function of Task and Structure "Demands". *Lanzetta, J. T., and Roby, T. B.* .. 121

SEPTEMBER

Predicting the Direction of Selective Recall: Its Relation to Ego Strength and *N* Achievement. *Alper, T. G.* .. 149
The Relationship Between Advanced Age and Mental Abilities. *Strother, C. R., et al.* 166
Judgments of Consensus During Group Discussion. *Stone, P., and Kamiya, J.* .. 171
Cognitive Processes and Interpersonal Predictions. *Leventhal, H.* .. 176

Conforming Behavior Under Two Conditions of Conflict in the Cognitive Field. *Samelson, F.* .. 181
The Repression Response to Implied Failure as a Function of the Hysteria-Psychasthenia Index. *Truax, C. B.* .. 188
Intra-Individual Consistency in Conceptualization. *Moran, L. J., et al.* .. 194
Distinguishing Characteristics of Collaborators and Resisters Among American Prisoners of War. *Schein, E. H., et al.* .. 197
The Relationship of Age and Privilege Status to Reaction Time Indices of Schizophrenic Motivation. *Rosenbaum, G., et al.* .. 202
The Effects of Sex-Role Identification Upon Problem-Solving Skill. *Milton, G. A.* .. 208
The Effects of Clear and Unclear Role Expectations on Group Productivity and Defensiveness. *Smith, E. E.* .. 213
The Relationship Between Overt and Fantasy Aggression as a Function of Maternal Response to Aggression. *Lesser, G. S.* .. 218
Affiliation Motivation and Productivity in Small Groups. *de Charms, R.* .. 222
Cognitive Set and Motivational Factors in the Perception of Neutral and Threat-Related Stimuli. *Wylie, R. C.* .. 227
Maternal Child-Rearing Practices and Authoritarian Ideology. *Hart, I.* .. 232
Catharsis and the Relief of Hostility. *Worchel, P.* .. 238
Assimilation and Contrast Effects in Reactions to Communication and Attitude Change. *Hovland, C. I., et al.* .. 244
Compatriot and Foreigner: A Study of Impression Formation in Three Countries. *Bruner, J. S., and Perlmutter, H. V.* .. 253

NOVEMBER

Consciousness as a Regulatory Field: A Theory of Psychotherapy. *Collier, R. M.* .. 275
The Effects of Fear Arousal and Suppression of Fear Upon Social Perception. *Feshbach, S., and Singer, R. D.* .. 283
The Masculinity-Femininity Dimensions in Normal and Psychotic Subjects. *Reed, M. R.* 289
Galvanic Skin Response as a Measure of Patient's Reaction to Therapist's Permissiveness. *Dittes, J. E.* .. 295
The Influence of the Mother's Presence on Children's Doll Play Aggression. *Levin, H., and Turgeon, V. F.* .. 304
Verbal Conditioning as a Function of Experimenter Characteristics. *Binder, A., et al.* 309
Mediated Generalization and the Incubation Effect as a Function of Manifest Anxiety. *Mednick, M. T.* .. 315
A Scale for Measuring Attitudes of Social Responsibility in Children. *Harris, D. B.* 322
A Cross-Cultural Survey of Some Sex Differences in Socialization. *Barry, H., III, et al.* 327
Avoidance Learning of Perceptual Defense and Vigilance. *Dulany, D. E., jr.* .. 333
The Relative Aversiveness of Warning Signal and Shock in an Avoidance Situation. *Sidman, M., and Boren, J. J.* .. 339
Selective Recall in Schizophrenia and Its Relation to Ego Strength. *Tamkin, A. S.* .. 345
Effects of Perceived Dependency Relationships Upon Conformity to Group Expectations. *Berkowitz, L.* .. 350
The Effect of Training Upon Accuracy and Variability in Interpersonal Perception. *Crow, W. J.* .. 355
Reference Groups, Membership Groups, and Attitude Change. *Siegel, A. E., and S.* 360
Socioeconomic Status and Conceptual Thinking. *Siller, J.* .. 365
Recall of Interrupted Tasks under Stress: A Phenomenon of Memory or of Learning? *Caron, A. J., and Wallach, M. A.* .. 372
Group Climate as a Factor in the Relevance and Accuracy of Social Perception. *Exline, R. V.* .. 382

VOL. 13 J. CLIN. PSYCHOL. OCTOBER, 1957

Child Personality Structure as Revealed in Teachers' Behavior Ratings. *Cattell, R. B., and Coan, R. W.* .. 315
Parental Attitudes and Academic Achievement. *Drews, E. M., and Teahan, J. E.* .. 328
Authoritarian Patterns in the Mothers of Schizophrenics. *Dworin, J., and Wyant, O.* 332
Authoritarian Attitudes in Children: I. The Effects of Age, I.Q., Anxiety and Parental Religious Attitudes. *Siegman, A. W.* .. 338
Sex Role Expectations and Criteria of Social Adjustment for Young Adults. *Beilin, H., and Werner, E.* .. 341
Outcome of Applying Three Techniques of Psychotherapy. *Ellis, A.* .. 344
MMPI Performance and Electroshock Treatment. *Dana, R. H.* .. 350
Patient Types in Outpatient Psychotherapy. *Rubinstein, E. A., and Lorr, M.* .. 356
Rhythmical Responses of Low Grade and Middle Grade Mental Defectives to Music Therapy. *Murphy, M. M.* .. 361
Some Normative Data on New MMPI Scales. *Hathaway, S. R., and Briggs, P. F.* .. 364
Serial Verbal Learning and Retroactive Inhibition in Aments and Children. *Cassel, R. H.* 369
A Comparison of Slow Learner's Scores on Three Individual Intelligence Scales. *Sharp, H. C.* .. 372

Neurosis and Problem-Solving Behavior. *Greenfield, N. S.* 375
Reliability of Clinical Judgment as a Function of Clinical Experience. *Hunt, W. A., et al.* 377
Context Effects in Judgment as a Function of Experience. *Jones, N. F.* 379
Galvanic Skin Responses Accompanying the Picture-Frustration Study. *Schwartz, M. M.* 382
Further Study of Psychogalvanometric Test for Neuroticism. *Herr, V. V., and Kobler, F. J.* 387
Multiple Solution Anagram Solving as an Index of Anxiety. *Wiggins, J. G.* 391
Trait Judgment of Photographs by Neuropsychiatric Patients. *Chambers, J. L.* .. 393
Psychodiagnostic Limitations of Szondi Interseries Changes. *Hurley, J. R.* 396
The Importance of the Pictorial Aspect in Determining Performance of the Picture-Frustration Study. *Schwartz, M. M.* 399
Self-Perceptions of Neuropsychiatric Patients on the W-A-Y Test. *Tolor, A.* 403
Comparison of Normals and Schizophrenics on a Work-Oriented Projective Technique. *Stotsky, B. A.* 406

VOL. 107 **J. COMP. NEUR.** APRIL, 1957

Sympathectomy in Amphibians. (Anatomical Considerations.). *Pick, J.* 169
A Mechanism for Excitation and Inhibition of the Mauthner's Cells in Teleost: A Histological and Neuro-physiological Study. *Retzlaff, E.* 209
The Morphogenesis and Some Functional Aspects of the Epiphyseal Complex in Lizards. *Steyn, W.* 227
The Hypothalamic Neurosecretory System of the Tree Frog *Hyla regilla. Wilson, L. D., et al.* 253
Effects of Pitressin and Water Injections on Secretions of Brain and Hypophysis in a Teleost. *Rasquin, P., and Stoll, L. M.* 273
Effects of Increased Motor Activity on the Dimensions and the Staining Properties of the Neuron Soma. *Edström, J.-E.* 295
Effect of Rubrospinal Tract Section on Ataxia. *Orioli, F. L., and Mettler, F. A.* .. 305

JUNE

Neurosecretion in the Human Cerebellum. *Shanklin, W. M.* 315
A Comparative Study of Certain Trigeminal Components in Two Soricid Shrews, *Blarina Brevicauda and Sorex Cinereus. Hyde, J. B.* 339
Studies on the Brain of the Guinea Pig. I. The Nuclear Pattern of Certain Basal Telencephalic Centers. *Johnson, T. N.* 353
The Olfactory Centers and Connections in the Cerebral Hemisphere of the Mole (*Scalopus aquaticus machrinus*). *Johnson, T. N.* 379
Ocular Muscle Proprioceptive Neurons in the Developing Chick. *Rogers, K. T.* .. 427
Site of Emetic Action of X-radiation in the Cat. *Borison, H. L.* 439
The Role of the Meningeal Tissues in the Hemato-Encephalic Barrier. *Rodriguez-Peralta, L. A.* 455

VOL. 50 **J. COMP. PHYSIOL. PSYCHOL.** APRIL, 1957

The Effect of Extent on the Intensity-Time Relation for the Visual Discrimination of Movement. *Brown, R. H.* 109
Further Studies of the Organization and Display of Sexual Behavior in Male Guinea Pigs. *Valenstein, E. S., and Goy, R. W.* 115
Maternal Behavior of Hypophysectomized Gravid Albino Rats and the Development and Performance of Their Progeny. *Obias, M. D.* 120
The Effect of Electroconvulsive Shock on a Learned Avoidance Response. *Carson, R. C.* 125
The Duration of Tonic Immobility in Guinea Pigs. *Bayard, J.* 130
The Effect of Food and Water Deprivation upon Intracranial Self-Stimulation. *Brady, J. V., et al.* 134
Function of Corpus Callosum in Contralateral Transfer of Somesthetic Discrimination in Cats. *Stamm, J. S., and Sperry, R. W.* 138
Skeletal Muscle Effects of the Chemical Block of Autonomic Impulses and the Extinction of Fear. *Arbit, J.* 144
Restoration of Tracking Proficiency as a Function of Amount and Delay of Analeptic Medication. *Payne, R. B., et al.* 146
Modification of Sex Drive and O_2 Consumption by Isolating and Grouping Male Guinea Pigs. *Riss, W., and Goy, R. W.* 150
The Effects of Early Experience on the Response to Pain. *Melzack, R., and Scott, T. H.* 155
The Effects of Variations in Handling upon Learning and Retention. *Bernstein, L.* .. 162
Experimental Analysis of the Hoarding Habit in the Rat: III. Terminal Reinforcement Under Low Drive. *Marx, M. H.* 168
Some Effects of Deprivation on Eating and Drinking Behavior. *Ghent, L.* 172
The Effect of Deprivation of Visual Incentives on Visual Exploration Motivation in Monkeys. *Butler, R. A.* 177
Temporal Relationship Within the Conditioning of a Saccharine Aversion Through Radiation Exposure. *Garcia, J., and Kimeldorf, D. J.* 180

Effect of Reinforcement Magnitude and of Order of Presentation of Different Magnitudes on Runway Behavior. *Metzger, R., et al.* 184
Learning and Performance as a Function of Drive Strength During Acquisition and Extinction. *Lewis, D. J., and Cotton, J. W.* 189
Response Reversal Following Different Amounts of Training. *Capaldi, E. J., and Stevenson, H. W.* 195
Conditions of Invariance and Modifiability in Simple Reversal Learning. *Estes, W. K., and Lauer, D. W.* 199
The Effect of Spacing Units on Simultaneous vs. Successive Discrimination. *Davis, R. H.* 207

JUNE

Conditioned Flexion Reflexes Acquired During Combined Catalepsy and De-efferentation. *Beck, E. C., and Doty, R. W.* 211
Uniphasic and Diphasic Wave Forms of the Skin Potential Response. *Wilcott, R. C., et al.* 217
Tachistoscopic Identification of Contour in Patients with Brain Damage. *Pollack, M., et al.* 220
Perceptual Curiosity, Exploratory Behavior, and Maze Learning. *Berlyne, D. E., and Slater, J.* 228
Hunger Drive and Reinforcing Effect of Novel Stimuli. *Chapman, R. M., and Levy, N.* 233
Discrimination Learning by Rhesus Monkeys to Auditory Incentives. *Butler, R. A.* 239
Evidence for a Dual Reinforcing Effect of Sugar. *Smith, M., and Duffy, M.* 242
Motivation, Performance, and Extinction. *Earl, R. W.* 248
The Effects of Training to Approach vs. to Escape from Electric Shock upon Subsequent Discrimination Learning. *Muenzinger, K. F., and Baxter, L. F.* 252
Solution of Oddity Problems by Cats. *Boyd, B. O., and Warren, J. M.* 258
Matching in Pigeons. *Ginsburg, N.* 261
The Relation of Secondary Reinforcement to Partial Reinforcement. *Mason, D. J.* 264
The Classical Conditioning of the Consummatory Response as a Determinant of Instrumental Performance. *Stein, L.* 269
Concurrent Activity Under Fixed-Interval Reinforcement. *Skinner, B. F., and Morse, W. H.* 279
A Comparison of Two Types of Warning Stimulus in an Avoidance Situation. *Sidman, M., and Boren, J. J.* 282
Transfer from a Stimulus Complex to Differentially Discriminable Components. *Babb, H.* 288
Transposition of Response by Children Trained in Intermediate-Size Problems. *Rudel, R. G.* 292
Laterality in the Use of the Hand, Foot, and Eye in Monkeys. *Cole, J.* 296
A Comparison of the Effects of E.C.S. and Anesthesia on Acquisition of the Maze Habit. *Leukel, F.* 300
Sound-Induced Convulsions in Rats Subjected to Cerebellar Damage. *Bevan, W., et al.* 307
Sound-Induced Convulsions in Rats Treated with Reserpine. *Bevan, W., and Chinn, R. McC.* 311
Two Procedures for the Establishment of "Imitative Behavior". *Church, R. M.* 315
Successive Discrimination Reversal Learning in the White Rat: A Comparison of Two Procedures. *Pubols, B. H., jr.* 319

AUGUST

Echolocation in Rats. *Riley, D. A., and Rosenzweig, M. R.* 323
The Effect of Certain Parameters on the Acquisition of Fear. *Mathers, B. L.* 329
Changes in Response Measures over Repeated Acquisitions and Extinctions of a Running Habit. *Lauer, D. W., and Carterette, T. S.* 334
Stimulus-Intensity Dynamism and Secondary Reinforcement. *Henderson, R. L.* 339
Some Training Conditions Affecting Secondary Reinforcement. *Wike, E. L., and McNamara, H. J.* 345
The Effects of Percentage of Partially Delayed Reinforcement on the Acquisition and Extinction of an Instrumental Response. *Wike, E. L., and McNamara, H. J.* 348
Delayed-Response Learning in the Marmoset and the Macaque. *Miles, R. C.* 352
Learning-Set Formation in the Squirrel Monkey. *Miles, R. C.* 356
Spontaneous Alternation and Stimulus Avoidance. *Sutherland, N. S.* 358
Delayed Alternation: Evidence for Symbolic Processes in the Rat. *Petrinovich, L., and Bolles, R.* 363
Habituation to Handling as a Factor in Retention of Maze Performance in Rats. *Barry, H., III* 366
The Effects of an Instructed Motor Response upon Somatic Responses to a Brief Tone. *Dawson, H. E., and Davis, R. C.* 368
The Effect of Satiation on the Sucking Response in Puppies. *James, W. T.* 375
Changes in Behavior and Visual Discrimination Performances After Selective Ablations of the Temporal Cortex. *Pinto Hamuy, T., et al.* 379

The Effect of Whole-Body X-Radiation upon Activity Drum, Straightaway, and Maze Performances of White Rats. *Fields, P. E.* 386
Proactive and Retroactive Effects of Electroconvulsive Shock on Approach-Avoidance Conflict. *Poschel, B. P. H.* 392
The Comparative Effects of E.C.S. and Anoxia on Memory. *Thompson, R.* 397
Memory Decrement Produced by E.C.S. as a Function of Distribution in Original Learning. *Thompson, R., and Pennington, D. F.* 401
Effects of Electroshock Convulsions on Learning in Rats as a Function of Age. *Tattan, J. V.* 405
The Effect of D.F.P. on Learning and Retention Following Physiological Recovery. *Platt, C. E., and Wickens, D. D.* 408
On Anti-Predator Responses in Certain Birds—A Reply. *Tinbergen, N.* 412
Careful Reporting and Experimental Analysis—A Comment. *Hirsch, J.* 415

VOL. 53 **J. EX. PSYCHOL.** JUNE, 1957

Goal-Box Cues and Pattern of Reinforcement. *Friedes, D.* 361
An Analysis of Tracking Behavior in Terms of Lead-Lag Errors. *Garvey, W. D., and Mitnick, L. L.* 372
Learning and Performance in a Complex Tracking Task as a Function of Visual Noise. *Briggs, G. E., et al.* 379
Perception of Nonsense Passages in Relation to Amount of Information and Speech-to-Noise Ratio. *Miller, I.* 388
Rest and Warm-Up in Bilateral Transfer on a Pursuit Rotor Task. *Walker, L. C., et al.* 394
Conflict and Information-Theory Variables as Determinants of Human Perceptual Curiosity. *Berlyne, D. E.* 399
The Vertical-Horizontal Illusion and the Visual Field. *Künnapas, T. M.* 405
Differential Eyelid Conditioning as a Function of Stimulus Similarity and Strength of Response to the C.S. *Gynther, M. D.* 408
Contingent Partial Reinforcement and the Anticipation of Correct Alternatives. *Brand, H., et al.* 417

VOL. 54 JULY, 1957

Training Under Two Drives, Alternately Present vs. Training Under a Single Drive. *Porter, L. W., and Miller, N. E.* 1
The Influence of Amount of Prerest Learning on Reminiscence Effects in Paired-Associate Learning. *Riley, D. A.* 8
Effect of Intertrial Interval on Acquisition and Extinction of a Running Response. *Cotton, J. W., and Lewis, D. J.* 15
The Electrical Phosphene Threshold as a Measure of Retinal Induction and Visual Organization. *Michaels, R. M.* 21
Learning the Statistical Properties of the Input in Pursuit Tracking. *Poulton, E. C.* 28
Studies of Distributed Practice: XV. Verbal Concept Learning as a Function of Intralist Interference. *Underwood, B. J.* 33
Differential Sensitivity in Gustation. *Schutz, H. G., and Pilgrim, F. J.* 41
Effect of Reduced Exposure Duration on Brightness Constancy. *Leibowitz, H., and Chinetti, P.* 49
The Relationship of Performance Level to Level of Arousal. *Stennett, R. G.* 54
Learning Through Stimulus Satiation. *Denny, M. R.* 62
Factors in the Recovery From Approach-Avoidance Conflict. *Berkun, M. M.* 65
Meaning Established by Classical Conditioning. *Staats, C. K., and A. W.* 74

AUGUST

Transfer of Experience With a Class-Schema to Identification-Learning of Patterns and Shapes. *Attneave, F.* 81
Extinction as a Function of Frustration Drive and Frustration Drive Stimulus. *Bernstein, B. B.* 89
Some Factors Affecting Performance on a Word-Formation Problem. *Battig, W. F.* 96
Effect of Addition of Irrelevant Verbal Cues on Perceptual-Motor Learning. *Braun, H. W., and Bendig, A. W.* 105
Operator Performance as a Function of the Statistical Encoding of Stimuli. *Garvey, W. D.* 109
Expectation and Resistance to Extinction of a Lever-Pulling Response as Functions of Percentage of Reinforcement and Amount of Reward. *Lewis, D. J., and Duncan, C. P.* 115
Effects of Counting and Ordering Habits on the Acquisition of a Simple Motor Skill. *Bowen, J. H., et al.* 121
Continuous Perspective Transformations and the Perception of Rigid Motion. *Gibson, J. J., and E. J.* 129
Studies of Distributed Practice: XVI. Some Evidence on the Nature of the Inhibition Involved in Massed Learning of Verbal Materials. *Underwood, B. J.* 139

Two Determinants of Associative Reaction Time. *Wiggins, J. S.* 144
The Effect of an Irrelevant Drive on Maze Learning in the Rat. *Braun, H. W., et al.* 148

SEPTEMBER

Studies in Incidental Learning: VI. Intraserial Interference. *Postman, L., and Adams, P. A.* 153
An Analysis of Maier's Pendulum Problem. *Saugstad, P.* 168
Serial Effects in Recall of Unorganized and Sequentially Organized Verbal Material. *Deese, J., and Kaufman, R. A.* 180
The Interaction of Frequency, Emotional Tone, and Set in Visual Recognition. *Fulkerson, S. C.* 188
Simple Reaction Time as a Function of Time Uncertainty. *Klemmer, E. T.* 195
Effects of Delay of Information Feedback and Task Complexity on the Identification of Concepts. *Bourne, L. E., jr.* 201
Some Sources of Error in Half-Heaviness Judgments. *Engen, T., and Tulunay, Ü.* .. 208
Retention and Meaningfulness of Material. *Dowling, R. M., and Braun, H. W.* .. 213
Learning Without Awareness and Extinction Following Awareness as a Function of Reinforcement. *Hirsch, J.* 218
Gradients of Error Reinforcement in Normal Multiple-Choice Learning Situations. *Marx, M. H.* 225
Value, Cost, and Information as Determiners of Decision. *Irwin, F. W., and Smith, W. A. S.* 229

VOL. 57 J. GEN. PSYCHOL. JULY, 1957

Relation of Aggression in the Personality to Outcome with Electro-Convulsive Shock Therapy. *Carpenter, L. G., jr.* 3
Psychology and the Logic of Similarity. *Noble, C. E.* 23
*Figural After-Effects, "Brain Modifiability", and Schizophrenia: A Further Study. *Wertheimer, M., and Jackson, C. W., jr.* 45
Reasoning as an Associative Process: III. The Role of Verbal Responses in Problem Solving. *Cofer, C. N.* 55
Psychologists' Attitudes on Psychological Issues: II. Static-Mechanical-Elementarism. *Morrow, W. R.* 69
Norms for Three Aspects of TAT Behavior. *Dana, R. H.* 83
*The Effect of Lesions in the Amygdaloid Area in Monkeys. *Jameson, H. D., et al.* 91
The Differentiation of Temperament from Personality. *Adcock, C. J.* 103
A Method for Educing the Present Correlates of Perception; an Introduction to the Method of Successive Covariation. *Shneidman, E. S.* 113
Figural After-Effects and Retinal Induction. *Motokawa, K., et al.* 121
The Effect of Intention Upon Learning. *Gleitman, H., and Gillett, E.* 137
An Exploratory Study in Selective Functions of Concepts. *Prall, R. D., and Brown, W. L.* 151
Problem Solving Difficulty as a Function of Deviation of "Meaning" of Physical Cues from Expected "Meaning". *Solley, C. M.* 165

Figural After-Effects, "Brain Modifiability", and Schizophrenia

Using two separate samples, it was found that schizophrenic males, on the average, have a *visual* figural after-effect smaller than that of normals, a difference significant at the 1 per cent. level when one technique was used, significant at the 5 per cent. level when a second technique was used. Schizophrenics also show a smaller *kinesthetic* figural after-effect than normals, a difference which remains significant at the 1 per cent. level when time is strictly controlled. They show less increase in figure reversal from one test period to the next, at the 1 per cent. level. Finally, schizophrenics are, at the 1 per cent. level, significantly less affected by a temporary discoordination of the visual and kinesthetic images of the hand.

(Authors' Abstr.)

The Effect of Lesions in the Amygdaloid Area in Monkeys

The findings of this study need considerable amplification and extension, especially with respect to the matter of objective evaluation of behaviour changes. It nevertheless appears from the data which have been presented that there is some indication as to which specific neural structures are significantly related to the altered behaviour syndrome which has been described. As has been seen, one group of animals in which the amygdaloid nuclei were primarily involved showed no detectable behavioral alterations until the development of delayed necrosis, which presumably destroyed the circumferentially located tissues. On the other hand, all the monkeys that exhibited positive effects from the lesions suffered damage in the subpallidal region. Finally, the Group IV animals were subjected to the production of small lesions intended to involve primarily this subpallidal area. Three of this final group of four monkeys developed changes similar to, though less pronounced than, the changes seen in monkeys of Groups I and II.

It is suggested, as a preliminary attempt to reconcile the seemingly contradictory findings of earlier studies, that it is reasonable to suppose that the surgical approach used by the various investigators may have caused incidental damage to the subpallidal region in some cases and not in others. Schreiner and Kling state that the lentiform nucleus and lower portion of the claustrum were involved in the majority of their preparations. As judged from this statement, it would in all probability be true that the area immediately ventral to the globus pallidus was injured or destroyed *in all* their animals. In the cat subjects of their study there were pronounced changes in the direction of tameness, increased sexuality, etc. The surgical approach which was used, namely, retraction of the temporal lobe and visualization of the optic tracts in order to give access to the pyriform cortex and amygdala, would be expected to cause destruction of the subpallidal region. The changes brought about in cats as a result of this approach were very different from the effects produced in this species by Bard and Mountcastle, who approached the same area by a different route. The latter authors exposed the wall of the lateral ventricle to permit visualization of Ammon's formation. Using this precise landmark, which lies ventral and caudal to the amygdaloid nucleus, Bard and Mountcastle then removed the nucleus by suction. This latter approach, which would seem much less likely to cause damage to the subpallidal area than did the approach of Schreiner and Kling, resulted in production of "bad-tempered" animals in which the slightest stimulation provoked anger and attack.

Turning from the work on cats to that on monkeys, we may ask whether the surgical approach used by Bucy and Kluver (4, 7) would have been likely to cause destruction of the subpallidal region. The available descriptions of their lesions include no specific comment on this point, but it is stated that the entire amygdaloid nucleus and the adjacent portion of the tail of the caudate were removed. Complete removal of these two structures could hardly be accomplished without producing at least some injury to the directly overlying tissue of the subpallidal region. It is thus probable that comparable neural structures in the two species of animals, monkey and cat, are related to the tameness, hypersexuality, oral-activity, motor-hyperactivity forms of behaviour.

The main thesis of the foregoing paragraphs is that the subpallidal region in both monkeys and cats has an important relation to the behaviour changes which have been described. It is interesting to speculate, in terms of the fact that different elements of the tameness-hyperactivity-sexuality syndrome were more marked in one than in another of our animals, whether or not such differences may ultimately be correlated with slight variations in the location of the lesions. Different parts of the subpallidal region will be sampled by making small lesions with the radioactive needles in future studies, for the sake of determining whether or not the behavioural syndrome may be fractionated.

(Authors' Abstr.)

OCTOBER

Anticipated Frustration as a Determinant of Anxiety. *Whiteman, M.* 183
The Comparative Reliability of Double and Single Rating Scales. *Bendig, A. W.* .. 197
Rater Reliability and the Heterogeneity of Clinical Case Histories. *Bendig, A. W.* .. 203
Is "Illusion" Illusion? *Mukerji, N.* 209
The Relationship Between Personality Adjustment and Scholarship Achievement in Male College Students. *Yeomans, W. N., and Lundin, R. W.* 213
Sequences of Restricted Associative Responses and Their Personality Correlates. *Hofstaetter, P. R., et al.* 219
Colors and the Color-Blind. *Hofstaetter, P. R., and Primac, D. W.* 229
Healthy Interaction: A Composite Clinical Picture. *Luft, J.* 241
Effect of an Electric Shock Stimulus Upon the Conceptual Behavior of "Anxious" and "Non-Anxious" Subjects. *Grant, D. A., and Patel, A. S.* 247
Discrimination Learning and Learning Sets to Visual Exploration Incentives. *Butler, R. A., and Harlow, H. F.* 257
A Flexible General Test Apparatus for the Monkey. *Murphy, J. V., and Miller, R. E.* 265
Brief Psychotherapy and Criteria of Success. *Rosenman, S.* 273
The Application of Some Measures of Language Behavior and Tension to the Letters Written by a Woman at Each Decade of her Life from 49 to 89 Years of Age. *Smith, M. E.* 289

VOL. 90 **J. GENETIC. PSYCHOL.** JUNE, 1957

The Relationship Between Intelligence and Age Among Superior Adults. *Ghiselli, E. E.* 131
Word Variety as a Measure of Bilingualism in Preschool Children. *Smith, M. E.* .. 143
Relationships Between Early Social Experience and Adult Aggressive Behavior in Inbred Mice. *King, J. A.* 151
Some Hypotheses on Perceptual and Learning Processes With Their Applications to the Process of Reading: A Preliminary Note. *Mann, H. P.* 167
The Effect of Frontal Cortical Lesions on Activity Wheel and Open-Field Behavior. *Stern, J. A.* 203
Hoarding Behavior in the Hooded Rat as a Function of Varied Alley Illumination. *Marx, M. H., et al.* 213
Spread of Effect: Animal Studies. *Marx, M. H.* 219

The Distinction Between Living and Not Living Among 7–10-Year-Old Children, With Some Remarks Concerning the So-called Animism Controversy. *Klingberg, G.* 227
Academic Achievement in a Group of Mentally Disturbed Adolescents in a Residential Treatment Setting. *Salzinger, K.* 239
Progress in the Use of English After 22 Years by Children of Chinese Ancestry in Honolulu. *Smith, M. E.* 255
Latent Extinction in a Multiple-*T* Maze Within Heterogeneous and Homogeneous Environments. *Brown, W. L., and Halas, E. S.* 259

VOL. 91 SEPTEMBER, 1957
Social Attitude Configurations in An Adolescent Group. *Livson, N., and Nichols, T. F.* 3
The Relation Between Expressed Self-Acceptance and Expressed Attitudes Toward Negroes and Whites Among Negro Children. *Trent, R. D.* 25
Notes on the Criterion Problem in Research, With Special Reference to the Study of Teacher Characteristics. *Ryans, D. G.* 33
Sucking Behavior: A Review of the Literature. *Ross, S., et al.* 63
An Investigation of Bar-Pressing Under Conditions of Fixed-Ratio and Continuous Secondary Reinforcement. *Levy, G. W., and Bevan, W.* 83
Developmental Trends in Pre-Adolescence and in Early Adolescence in Self-Evaluation. *Amatora, M.* 89
Sociempathic Ability in a Group of Institutionalized Delinquent Boys. *Trent, R. D.* 99
Vigilance as a Factor in Reinforcement. *Boguslavsky, G. W.* 109
The Rorschach Records of a Superior Child. *Allen, R. M.* 115
Relationships Between Some Background Factors and Children's Interpersonal Attitude. *Koppitz, E. M.* 119
The Validity of the Guess-Who Technique With Large Adolescent Populations. *Keislar, E. R.* 131
Activity Under Low Motivational Levels as a Function of the Method of Manipulating the Deprivation Period. *Hall, J. F., and Connon, H. E.* 137

DECEMBER
Interests and Leadership Among Adolescents. *Marks, J. B.* 163
Lasting Effects of Alcohol on the Reduction of Anxiety in Rats. *Scarborough, B. B.* 173
Animistic Responses as a Function of Sentence Contexts and Instructions. *Simmons, A. J., and Goss, A. E.* 181
Degree of Disturbance in Figure Drawings as Related to Mode of Approach to Problem Solving. *Rawn, M. L.* 191
The Effects of Shock on Anxiety-Motivated Behavior in the Rat. *Moyer, K. E.* .. 197
The Socioeconomic Status, Intelligence, and Psychometric Pattern of Native-born White Homeless Men. *Levinson, B. M.* 205
The Child's Understanding of Kinship Terms: A Study in the Development of Relational Concepts. *Danziger, K.* 213
Linear Position Preference Habits of Monkeys. *Davis, R. T.* 233
Milieu Differences in Social Competence. *Werner, E.* 239
Development of Self Recognition. *Dixon, J. C.* 251
Properties of Stimuli Associated With Strong and Weak Hunger Drive in the Rat. *Scarborough, B. B., and Goodson, F. E.* 257
Elements of Conditioning in Normal and Pathological Human Behavior. *Welch, L., and Hayes, R. F.* 263

VOL. 13 J. INDIVID. PSYCHOL. NOVEMBER, 1957
The 20th Anniversary of the Death of Alfred Adler (1870–1937) 111
Adler and the Future of Ego Psychology. *White, R. W.* 112
The Third Human Nature. *Murphy, G.* 125
The Self, Its Derivative Terms, and Research. *Combs, A. W., and Soper, D. W.* .. 134
Modern Drug Treatment and Psychotherapy. *Adler, A.* 146
Psychotherapy as Correction of Faulty Social Values. *Dreikurs, R.* 150
The Significance of Individual Creativity for Psychotherapy. *Moustakas, C. E., and Smillie, D.* 159
Religion and Psychotherapy. *Reissner, A.* 165
A Multiple Approach to Child Guidance. *Deutsch, D.* 171
Re-Structuring Mistaken Family Relationships. *Beecher, W., and M.* 176
Early Childhood Recollections as Aids in Group Psychotherapy. *Kadis, A. L.* .. 182
Some Aspects of Stuttering in the Light of Adlerian Psychology. *Barbara, D. A.* .. 188

VOL. 1 J. MENT. DEFIC. RES. JULY, 1957
Genetics of Anencephaly. *Penrose, L. S.* 4
The Relationship Between Incentive, Personality Type and Improvement in Performance of Imbeciles. *Claridge, G. S., and O'Connor, N.* 16
Some Observations on the Leucocytes in Mongolism. *Mittwoch, U.* 26

A Survey of Mental Deficiency Problems in the United States of America. *Thomas, D. H. H.* 33
Phenylketonuria. *Hsia, D. Y.-Y., et al.* 53

VOL. 1 **J. NEUROCHEM.** 1957

The Structure of Plasmalogens—III. The Nature and Significance of the Aldehydogenic Linkage. *Rapport, M. M., and Franzl, R. E.* 303
Histochemical Studies on Monoamine Oxidase in the Mid-Brain of the Mouse. *Arioka, I., and Tanimukai, H.* 311
The Chemical Changes in Regenerating Neurons. *Brattgård, S.-O., et al.* 316
*5-Hydroxytryptamine (Serotonin, Enteramine) Content of Structures of the Limbic System. *Paasonen, M. K., et al.* 326
Isolation of Factor I. *Bazemore, A. W., et al.* 334
The Effect of Nerve Section on the Free Amino Acids of Nervous Tissue. *Porcellati, G., and Thompson, R. H. S.* 340
Excitants and Depressants of the Central Nervous System, on Isolated Electrically-Stimulated Cerebral Tissues. *McIlwain, H., and Greengard, O.* 348
The Electrophoretic Separation of the Soluble Proteins of the Brain. *Robertson, D. M.* 358
The Persistence of Taurine in the Brains of Pyridoxine-Deficient Rats. *Hope, D. B.* .. 364
Histochemical Study of Changes Occurring During the Degeneration of Myelin. *Wolman, M.* 370

5-*Hydroxytryptamine* (*Serotonin*, *Enteramine*) *Content of Structures of the Limbic System*

This report deals primarily with the results of a study of the 5-hydroxytryptamine (5-HT) content of cortical and subcortical structures of the limbic system. For the purpose of comparison and control, assays were performed on representative neocortical areas, as well as on a number of other non-limbic nervous structures.

All the cortical assays showing relatively high values of 5-HT were confined to limbic structures. These included the medial and lateral pyriform cortex, the entorhinal cortex, and hippocampus. All the remaining limbic cortical structures, as well as the neocortical areas that were sampled, had considerably smaller amounts of the amine. In the hippocampus (archicortex) the highest concentration of the amine was found to be in the gray matter immediately adjoining the white. Segments of the body of this structure showed no significant differences in assay values. In the limbic mesocortex there appeared to be a graded decline in values in a direction away from the olfactory trigone.

Assays of limbic nuclear structures were confined to the amygdala, septum, and hypothalamus. All had high values of 5-HT that were the same as, or exceeded, those of the caudate nucleus and of the tissue taken from the region of the putamen.

The region of the intercolumnar tubercle (located between the columns of the fornix which is the main conducting pathway of the hippocampus) had an average assay value which was more than three times that of the fimbrial fornix and was close to that previously reported for the area postrema. The tubercle and the area postrema are recognized to have anatomical similarities.

The parenteral administration of a monoamine oxidase inhibitor, iproniazid, resulted in an increase in 5-HT in some structures, but not in others. A number of determinations of 5-hydroxytryptophane decarboxylase activity provided further evidence that nervous structures which contain 5-HT are generally able to synthesize it.

(Authors' Abstr.)

VOL. 20 **J. NEUR. NEUROSURG. PSYCHIAT.** NOVEMBER, 1957

Arteriovenous Malformations of the Brain and their Effect upon the Cerebral Vessels. *Carrasco-Zanini, J.* 241
The Late Sequelae of Pneumococcal Meningitis. *Smith, H. V., et al.* 250
Electro-encephalography in a Case of Islet Cell Adenoma. *Laidlaw, J., and Rab, S. M.* 260
Manifestations of Suprarenal Insufficiency Occurring with Pituitary Tumours. *Jefferson, A.* 265
Neurological Manifestations in Haemangioma of the Vertebrae. *Askenasy, H., and Behmoaram, A.* 276
*Rapidly Progressing Dementia in Disseminated Sclerosis. *Bergin, J. D.* 285
Fatal Damage to the Brain by Epileptic Convulsions after a Trivial Injury to the Head. *Small, J. M., and Woolf, A. L.* 293
Frequency Analysis of Physiological and Neurotic Tremors. *Redfearn, J. W. T.* .. 302

Rapidly Progressing Dementia in Disseminated Sclerosis

Two cases are described in which there was a rapid onset of global dementia associated with the clinical signs of multiple lesions in the brain and spinal cord, leading to the diagnosis of disseminated sclerosis.

Investigation in both cases showed abnormal EEG records, ventricular dilatation, and cortical atrophy.

Both patients had to be transferred to mental hospitals on account of their dementia, and the disease rapidly progressed to a fatal issue.

In one case the diagnosis of disseminated sclerosis was confirmed by post-mortem examination.

The rarity of dementia in disseminated sclerosis being of a degree requiring admission to a mental hospital is emphasized, and the significance of the air studies, EEG abnormalities and pathological lesions is discussed in relation to the mental disorder observed in these cases.

(Author's Abstr.)

VOL. 16 J. NEUROPATH. EX. NEUR. OCTOBER, 1957

Hyperergic Encephalomyelitides Following Exanthematic Diseases, Infectious Diseases and Vaccination. *Ferraro, A., and Roizin, L.* 423
Bilateral Symmetrical Degeneration of the Thalamus. A Clinico-Pathological Study. *Schulman, S.* 446
Neurological Lesion 5 in Cats Following Cerebrospinal Fluid Manipulation. *Bunge, R. P., and Settlage, P. H.* 471
Decortication as a Result of Widespread Circulatory and Anoxic Damage. *Zeman, W., and Youngue, E.* 492
In Vitro Cultures of Human Meningioma Tissue. *Kersting, G., and Lennartz, H.* 507
The Morphology of Neuroglia in Tissue Culture with Comparisons to Histological Preparations. *Wolfgram, F., and Rose, A. S.* 514
Pattern of Regeneration of Muscle from Progressive Muscular Dystrophy Patients Cultivated *in Vitro* as Compared to Normal Human Skeletal Muscle. *Geiger, R. S., and Garvin, J. S.* 532
Boeck's Sarcoid in Chronic Meningo-Encephalitis. Organic Psychosis with Massive Softening due to Boeck's Disease. *Cares, R. M., et al.* 544

VOL. 20 J. NEUROPHYSIOL. SEPTEMBER, 1957

Functional Organization of Descending Vestibular Influences. *Gernandt, B. E., et al.* 453
Differentiation of Tonic from Phasic Alpha Ventral Horn Cells by Stretch, Pinna and Crossed Extensor Reflexes. *Granit, R., et al.* 470
Conditioned Electrocorticographic Potentials and Behavioral Avoidance Response in Cat. *Chow, K. L., et al.* 482
Physiological and Pharmacological Consequences of Different Synaptic Organizations in Cerebral and Cerebellar Cortex of Cat. *Purpura, D. P., and Grundfest, H.* 494
Functional Organization of Neuromuscular Spindle in Toad. *Eyzaguirre, C.* 523
Colloquium on the History of Neurophysiology held at the Annual Meeting of the American Electroencephalographic Society, Atlantic City, N.J., June, 1956. The Sherrington School of Physiology. *Denny-Brown, D.* 543

NOVEMBER

Postsynaptic Electrogenesis in Septate Giant Axons. I. Earthworm Median Giant Axon. *Kao, C. Y., and Grundfest, H.* 553
Evolution of Some Electrical Signs of Conditioning. Part I. Normal Cat and Rabbit. *Morrell, F., et al.* 574
*Effects of Cingulectomy on Social Behavior in Monkeys. *Mirsky, A. F., et al.* 588
Negative After-Potential of Frog's Skeletal Muscle. *Frank, G. B.* 602
Effects of Small Frontal Lesions on Delayed Alternation in Monkeys. *Mishkin, M.* 615

Effects of Cingulectomy on Social Behaviour in Monkeys

1. Bilateral cingular gyrus ablations were performed in five young *Macaca mulatta* monkeys, after systematic observations of their behaviour in reponse to man (individual-cage situation) and to other animals in social colony (group-cage situation).

2. Three of the five operated animals showed more aggressiveness (or fearlessness) in response to man immediately after operation and the group effect was significant. This change proved to be temporary, for the operated animals did not differ significantly from their pre-operative status in a post-operative comparison approximately two months later.

3. Only one of the operated animals showed any marked changes in the group-cage situation, and the interpretation of these changes is equivocal.

4. The differences among the effects in the several animals do not appear to be related to differences in the locus or extent of the lesions.

5. These findings were discussed in relation to previous studies: the effect on individual-cage behaviour appears to be a fairly consistent and repeatable effect of cingulectomy; the effects previously reported on group-cage behaviour may be a function of the inadequacy of the observational technique used in these studies.

(Authors' Abstr.)

VOL. 124 J. NERV. MENT. DIS. OCTOBER, 1956

A Longitudinal Study of Ninety Schizophrenic Women. *Bender, L., and Hitchman, I. L.* 337
Atypical Facial Pain Syndromes of Psychogenic Origin. *Lesse, S.* 346
A Technique for the Assessment of Affect Change, *Cohen, S. I., et al.* 352
*Drops of Protein in Brains of Hospital Patients. *Papez, J. W., and B. P.* 361

Psychophysiologic Aspects of the New Chemotherapeutic Drugs in Psychiatry. *Deniker, P.* 371
*Doxylamine: A New Compound for the Symptomatic Treatment of Schizophrenia. *Ferguson, J. T.* 377
*Excretion of Urinary Corticoids in Mental Patients. *Smith, F. L., et al.* 381
*An Electrophysiological Analysis of the Actions of Some Drugs Useful in the Therapy of Psychotic Disorders. *Marrazzi, A. S., and Hart, E. R.* 388
*Experimental Production in Rats of Abnormal Cycles in Behavior and Metabolism. *Richter, C. P., and Rice, K. K.* 393
*Toxicity of Blood Serum from Schizophrenic and Non-Schizophrenic Subjects. *Fedoroff, S., and Hoffer, A.* 396
*A Follow-up Study of Patients Treated by Thalamotomy and by Combined Frontal and Thalamic Lesions. *Spiegel, E. A., et al.* 399
Factors Relative to the Occurrence and Distribution of Illness in a Homogeneous Population of Ostensibly Healthy Individuals. *Ostfeld, A., et al.* 405
Correlation Between an Anomaly of the Intracellular Metabolism of Adenosine Nucleotides and Schizophrenia. *Boszormenyi-Nagy, I., et al.* 413
An Observation Chart for Ward Personnel. *Smith, J. A.* 417
Art Therapy in a Total Treatment Plan. *Freeman, R. V., and Friedman, I.* 421

Drops of Protein in Brains of Hospital Patients

The paper described round pink drops of protein seen in brains of psychotic and mentally deficient patients who had some form of stupor prior to death. They were numerous in cases with clouded states, disorientation, stupor, catatonia, uremia, and "edema" of brain. The drops of protein came from dissolved lymphocytes. They were seen inside of small blood vessels and in the cerebral cortex in suspensions under phase contrast microscopes at 970 diameters. Lymphocytes filled with living, moving, mycotic spores were described. Many of them were dissolved by lysis and gave rise to round pink drops of protein. The drops were seen in spaces in gray matter and inside of the blood vessels. When lymphocytes died, they dissolved, including nucleus and spores, to form the drops of protein seen beside the vessels. The drops probably obstructed flow of cerebral fluid through glial spaces, and produced hypoxia or anoxia. In many schizophrenics cytolysis was a severe dissolution of nerve cells. At autopsy the brains gave the impression of edema, cloudy arachnoid and congested pial vessels. The origin of some of these drops was observed coming from dissolving lymphocytes. Most of them were formed prior to death. Their probable constitution was globulin which contained a lysin. They occurred at all ages when edema of the brain was seen. The whole process of their formation and nerve cell destruction gave a more complete picture of what took place in severe mental illness. The amyloid bodies of protein origin were the remains of a burned out disease of the brain. The authors have shown the sclerotic patches on blood vessels and indicated how they may restrict flow of blood and contribute to hypoxia as well as hypertension. Strains of mycotic spores in red blood corpuscles were presented as the probable source of those in nerve cells and sclerotic patches. Mycotic toxins including serotonin were discussed. Mycotic pigments were mentioned.

(Authors' Abstr.)

Doxylamine: A New Compound for the Symptomatic Treatment of Schizophrenia

Doxylamine is an antihistamine which has been used in small doses (as Decapryn) for many years in the treatment of allergic diseases. Recently large doses have been tried in psychotic patients. The drug appears to be safe in doses up to 1,600 mg. daily by mouth and encouragingly effective in many patients in daily dosage of 300 mg. to 900 mg. In a group of 108 female patients (mostly schizophrenic) it has been most useful in those who exhibit unpredictable, psychotic behaviour sometimes of an assaultive nature, in those who are moderately improved on other drugs but are making no further progress, and in those who suffer from hallucinations and delusions. It can be given concurrently with the other drugs commonly employed to modify psychotic symptoms.

(Authors' Abstr.)

Excretion of Urinary Corticoids in Mental Patients

Urinary corticoid excretion was studied in selected groups of 72 mental patients and a group of 37 normal controls; in a group of 19 mental patients before and after electroshock therapy; and in 12 patients during the course of electroshock therapy.

There was no significant association between age or sex and corticoid level.

The variability in corticoid excretion in the schizophrenic group of patients, both acute and chronic, was significantly greater than in the depressive and normal control groups.

The variability in corticoid excretion was significantly reduced following electroshock therapy.

(Author's Abstr.)

An Electrophysiological Analysis of the Actions of Some Drugs Useful in the Therapy of Psychotic Disorders

1. By the use of evoked electrocortical responses as an index of synaptic activity in the cat brain, the study of the action of drugs has been further examined in relation to its relevance to clinical data and to problems of mental disturbance.

2. The list of substances shown in this way to impair and disturb cerebral functions includes adrenaline and adrenaline derivatives, mescaline and lysergic acid diethylamide. To this have been added serotonin and bufotenine, both of which show very high cerebral synaptic inhibitory activity.

3. The serotonin naturally present in the brain can be caused to accumulate, by interfering with its destruction through the injection of iproniazid, until it produces cerebral synaptic inhibition.

4. The tranquilizers reputed to be of clinical use are correspondingly effective in preventing the impairment of cerebral synaptic function produced by mescaline in the cat.

5. The correspondence of the animal with the clinical data speaks for the pertinence of the animal technique developed.

6. This kind of study of function in units of the central nervous system offers promise of understanding the more complex patterns into which they can be built, the disturbances that may occur and the means of modifying them therapeutically.

(Authors' Abstr.)

Experimental Production in Rats of Abnormal Cycles in Behavior and Metabolism

The fact, that regular cycles can thus be produced experimentally by interference with the function of the thyroid gland surgically, chemically, or pharmacologically, should lead to a better understanding of the origin of cycles seen in psychiatric patients as well as in patients with periodic disease.

(Authors' Abstr.)

Toxicity of Blood Serum from Schizophrenic and Non-Schizophrenic Subjects

Blood serum from schizophrenic and surgical patients was highly toxic to strain L cells, whereas serum from healthy adults and from non-schizophrenic mental patients was in most cases less toxic. There was no significant difference in the toxicity of serum from healthy adults and from non-schizophrenic mental patients. There was good correlation between degree of serum toxicity, Lewis and Piotrowski score and the clinical diagnoses.

(Authors' Abstr.)

A Follow-up Study of Patients Treated by Thalamotomy and by Combined Frontal and Thalamic Lesions

Follow-up studies were carried out in 77 cases of thalamotomy. They show that the best long-range effects in cases refractory to non-operative procedures were obtained in severe anxiety neurosis and states of depression. Combinations of frontal lobe and thalamic operations were successful in about one-half of the cases in which either of these operations failed to improve the emotional disorder. Thalamotomy should be considered as a secondary operation in cases unrelieved by frontal leucotomy.

(Author's Abstr.)

NOVEMBER

Electroencephalographic Changes in Animals under the Influence of Hypnosis. *Schwarz, B. E., and Bickford, R. G.* 433
*An Inquiry into the Mechanism of Action of Electric Shock Treatments. *Fleming, T. C.* 440
The Psychosis of Association—Folie à Deux. *Dewhurst, K., and Todd, J.* 451
Some Recurrent Life History Patterns Observed in Patients with Malignant Disease. *Leshan, L., and Worthington, R. E.* 460
*Effects of Psychotomimetic Compounds on Certain Oxidative and Hydrolytic Enzymes in Mammalian Brain. *Clark, L. C., jr., et al.* 466
Psychophysiological Studies on Schizophrenic Patients. *Clark, L. D., and Eik-Nes, K.* 473
Are the First Born More Susceptible to Functional Mental Diseases? *Raychaudhuri, A. K.* 478
The Visual Field in the Sensorimotor Induction Syndrome and Its Changes under the Influence of Colors. *Halpern, L., and Landau, J.* 487
Incidence of Fractures in Convulsive Therapies with and without Anectine. *Pool, C. S., and Ault, C. C.* 492
Use of Succinylcholine Chloride (Anectine) in Electroshock Therapy. *Karliner, W., and Emma, A. J.* 496
The Recurrence of Seizures in Time. *Aaronson, B. S.* 500
*The Effects of Frenquel upon Chronic Disturbed Patients. *Peak, E. C., et al.* .. 504
*A Clinical Evaluation of Frenquel. *Ayd, F. J., jr.* 507
The Phantom Limb: A Proposed Theory of Unconscious Origins. *Zuk, G. H.* .. 510
Religious Background of Patients in a Mental Hygiene Setting. *Eichler, R. M., and Lirtzman, S.* 514

Normal and Neurotic Olfactory Behavior in Monkeys. *Masserman, J. H., and Pechtel, C.* 518
Carotid Sinus Convulsions Treated by Surgery. *Rosner, S.* 520

An Inquiry into the Mechanism of Action of Electric Shock Treatments

Pathologically, there may be temporary cellular changes following a fit. Physiologically, a convulsion appears to act as a non-specific stress situation. Biochemically, a contradiction exists. On the one hand, a fit seems to increase neuronal metabolism. On the other hand, a fit may depress neuronal metabolism or at least energy synthesis. The point is that none of these effects seems adequate to explain the mechanism of action of EST.

Richter has pointed out that the biochemical events occurring in a convulsion though dramatic are short lived. He postulates that perhaps a change in cell lipoproteins is important It may be that the most fundamental process which occurs in a convulsion is some sort of change in structure at the intracellular level. Since energy is required not only for impulse transmission but also to maintain cell structure, shifts in energy synthesis or degradation could ultimately affect the organization of the neuron.

Manifestations of such a hypothetical cellular shake-up may be the shifts in ionic concentration, appearance of new substances outside the cell, change in the blood-brain barrier, restorative effect of pyrimidines, changes in cellular appearance, and so forth. Why a convulsion is necessary to produce this change and why it affects the course of the mental disease, are unanswerable questions at present. Indeed, at this level of study, the problem of the mechanism of action of electric shock treatment begins to merge with the problem of the causation of psychoses.

(Author's Abstr.)

Effects of Psychotomimetic Compounds on Certain Oxidative and Hydrolytic Enzymes in Mammalian Brain

In a study of mescaline and chemically related compounds, a series of nineteen phenethylamines and thirty closely related analogs were found to exert strikingly differential effects on alkaline phosphatase activity and on pyruvate utilization in brain tissue preparations. In addition, ten other compounds of neuropharmacological interest were tested for their influence on alkaline phosphatase and on lactic and malic dehydrogenase. Bufotenin and the tranquilizers significantly increased phosphatase activity. The lactic and malic dehydrogenase systems were relatively resistant to the compounds tested.

The influence of the mescaline analogs on enzyme activity has been analyzed in terms of the structural configurations of these compounds.

(Authors' Abstr.)

The Effects of Frenquel upon Chronic Disturbed Patients

1. Frenquel, given in divided doses totalling 60 mg. daily, did not significantly decrease delusions and hallucinations in this study.
2. Frenquel did not significantly improve ward adjustment in this experiment.
3. Frenquel appears to have no advantageous effect upon chronic female patients in this hospital, and there are suggestions that it may decrease inhibitory tendencies among some hallucinating patients. The question of whether the drug actually has a negative effect upon ward adjustment, as indicated by the earlier study, requires further investigation.

(Authors' Abstr.)

A Clinical Evaluation of Frenquel

Frenquel is an interesting drug. The results obtained with it in the treatment of acute psychotic states are variable and inconsistent. Nevertheless, the findings in this study suggest that it should be tried in acute schizophrenic reactions, particularly in those of recent origin in which the symptoms resemble those of mescaline and LSD-25 psychoses. It also may benefit senile confusional states, especially those originating after surgery. Although the results obtained in toxic psychoses are difficult to define, the use of Frenquel in such states is recommended. Finally, the combination of this drug with electroconvulsive therapy should be investigated further.

(Author's Abstr.)

DECEMBER

Emergency Psychotherapy and Mental First Aid. *Meerloo, J. A. M.* 535
An Historical Survey of Psychosomatic Medicine. *Kaplan, H. I., and H. S.* 546
The Motivating Action of Pleasure. *Buchenholz, B.* 569
A Study of the Uptake of Radioactive Phosphorus in the Brain, Endocrine and Other Organs of LSD-Treated Rats. *Lingjaerde, P., and Skaug, O. E.* 578
The Psychological Functioning of Aged Individuals with Normal and Abnormal Electroencephalograms: II. A Study of Hospitalized Individuals. *Barnes, R. H., et al.* 585
A Flexible Approach to Group Therapy. *Fantus, R. A., et al.* 594
*The Coincidence of Rheumatoid Arthritis and Schizophrenia. *Pilkington, T. L.* .. 604
Chlorpromazine and Mysoline in the Control of Convulsive Epilepsy in Mentally Deficient Patients. *Rettig, J. H.* 607

Premorbid Adjustment and Subsequent Discharge. *Farina, A., and Webb, W. W.* .. 612
Reserpine in Acute Psychotic States. *Hickerson, G. X., jr., et al.* .. 614
The Coincidence and Constancy of Mortality Figures for Aged Psychotic Patients Admitted to State Hospitals. *Whittier, J. R., and Williams, D.* .. 618
The Diseased Brain and Homicide. *Podolsky, E.* .. 621
Fatality Following Electroshock Therapy. *Oatman, J. G.* .. 625

The Coincidence of Rheumatoid Arthritis and Schizophrenia

An unselected group of 360 chronic mental hospital women patients over the age of forty has been examined for evidence of rheumatoid arthritis. Five were found to have rheumatoid arthritis, whereas the finding of 11–14 (3–4 per cent.) was anticipated. Among the schizophrenic group of 130 the incidence was either 0 or 0·8 per cent. These findings are discussed along with possible explanations.

(Author's Abstr.)

VOL. 14 J. NEUROSURG. SEPTEMBER, 1957

The Place of Neurological Surgery in the Undergraduate Curriculum. *Davidoff, L. M.* 475
Neurofibromas of the Fifth Cranial Nerve. *Olive, I., and Svien, H. J.* .. 484
Circulatory Dynamics of the Canine Spinal Cord, Temporal Phases of Blood Flow Measured by Fluorescein and Serioroentgenographic Methods. *Margolis, G., et al.* 506
Gliomas of the Optic Pathways in Childhood. *Fowler, F. D., and Matson, D. D.* .. 515
Observations on Patency of Cervical Carotid Artery Following Surgical Treatment for Thrombosis. *Jackson, I. J., and Fromm, S. M.* .. 529
Beta Radiation of the Feline Caudate Nucleus: Late Results. *Bailey, O. T., et al.* .. 536
Vertebral Arteriography in the Study of Subarachnoid Hemorrhage. *Spatz, E. L., and Bull, J. W. D.* .. 543
Successful Separation of Craniopagus Twins. *Voris, H. C., et al.* .. 548

NOVEMBER

The Varying Expressions of Embryonal Atresia of the Fourth Ventricle in Adults. Arnold-Chiari Malformation, Dandy-Walker Syndrome, "Arachnoid" Cyst of the Cerebellum, and Syringomyelia. *Gardner, W. J., et al.* .. 591
Periarteritis Nodosa as a Source of Subarachnoid Hemorrhage and Spinal Cord Compression. Report of a Case and Review of the Literature. *Haft, H., et al.* .. 608
Studies of Trigeminal Nerve Potentials. Overreaction to Tactile Facial Stimulation in Acute Laboratory Preparations. *King, R. B., and Barnett, J. C.* .. 617
Observations in a Case of Hydrocephalus Treated with Diamox. *Elvidge, A. R., et al.* 628
Experimental Occlusion of Dural Sinuses. *Owens, G., et al.* .. 640
Hypothermia Anesthesia in the Sitting Position. Report of Two Cases of Acoustic Neurinoma. *Rand, R. W.* .. 648
Experimental Cingulumotomy and Modification of Morphine Withdrawal. *Foltz, E. L., and White, L. E., jr.* .. 655
Isotope Transfer Test for Diagnosis of Ventriculosubarachnoidal Block. *Bell, R. L.* 674
Infundibuloma. A Case Report with a Brief Review of the Literature. *Posener, L., et al.* 680
Combined Retino-Cerebellar Angiomatosis and Deep Cervical Angiomas. Case Report. *Di Chiro, G.* .. 685
Glioblastoma Multiforme of Both the Septum Pellucidum and the Corpus Callosum. Case Report. *Epstein, J. A., and B. S.* .. 688
A Simple Arrangement to Facilitate Tidal Drainage. *Mellergaard, M.* .. 693
Improved Lower-Limb Negative-Pressure Equipment for the Reduction of Cerebral Blood Pressure in Neurosurgery. *Hodder, B. H.* .. 695

VOL. 25 J. PERSONAL. SEPTEMBER, 1956

Effects of Anxiety, Stress, and Task Variables on Reaction Time. *Farber, I. E., and Spence, K. W.* .. 1
Past Experience and Present Personality Dispositions as Determinants of Selective Auditory Memory. *Davids, A.* .. 19
The Effects of Stuttering Behavior and Response Set on Recognition Thresholds. *Spielberger, C. D.* .. 33
Dynamic Systems, Perceptual Differentiation, and Intelligence. *Livson, N., and Krech, D.* .. 46
Random versus Systematic Distribution of Information in Communication Nets. *Shaw, M. E.* .. 59
A Further Study of Infantile Handling and Adult Avoidance Learning. *Levine, S.* .. 70
The Judgment of Ambiguous Stimuli as an Index of Cognitive Functioning in Aging. *Korchin, S. J., and Basowitz, H.* .. 81
Self-Ratings and TAT: Their Relations to Each Other and to Childhood Background. *Child, I. L., et al.* .. 96

DECEMBER, 1956

Psychological Set and Social Conformity. *Thibaut, J. W., and Strickland, L.* 115
The Role of Type of Distracter in the "Concrete" Conceptual Performance of Schizophrenics. *Chapman, L. J.* 130
The Influence of Social Context on the Perception of Faces. *Cline, M. G.* 142
A Theory and Methodology for Measuring Fantasy and Imaginative Expression. *Leary, T.* 159
The Effects of Need-Achievement and Self-Ideal Discrepancy on Performance under Stress. *Miller, K. S., and Worchel, P.* 176
The Relationship between Test Anxiety, "Threat-Expectancy", and Recognition Thresholds for Words. *Smock, C. D.* 191
The Effects of Brain Damage on the Perception of Apparent Movement. *Brenner, M. W.* 202
Learning as a Function of Perceived Similarity to Self. *Bieri, J., and Trieschman, A.* 213
On the Unity of Thought and Belief. *Rokeach, M.* 224

MARCH, 1957

Line Drawings and Matching Responses to Words. *Scheerer, M., and Lyons, J.* 251
Achievement Imagery and Motivational Instructions as Determinants of Verbal Learning. *Hurley, J. R.* 274
A Methodological Analysis of Several Revised Forms of the Iowa Picture Interpretation Test. *Johnston, R. A.* 283
The Generality of Conformity Behavior as a Function of Factual Anchorage, Difficulty of Task, and Amount of Social Pressure. *Blake, R. R., et al.* 294
Personality Characteristics Related to Susceptibility to Influence by Peers or Authority Figures. *Berkowitz, L., and Lundy, R. M.* 306
Operant Motor Behavior in Acute Schizophrenics. *King, G. F., et al.* 317
Motivation and Task Complexity as Factors in the Psychomotor Responses of Schizophrenics. *Stotsky, B. A.* 327
Self-Perception and Goal-Setting Behavior. *Steiner, I. D.* 344
The Differential Evaluation of Males and Females. *McKee, J. P., and Sherriffs, A. C.* 356
The Consistency of Attitude Patterns as a Function of Body Type. *Winthrop, H.* 372
The Effect of Anxiety and Two Kinds of Failure on Serial Learning. *Sarason, I. G.* 383

JUNE

Reactions to Unfavorable Evaluations of the Self Made by Other Persons. *Harvey, O. J., et al.* 393
Conformity as a Defense Mechanism and a Form of Resistance to Genuine Group Influence. *Hoffman, M. L.* 412
The Experimental Induction of Perceptual Vigilance and Defense. *Pustell, T. E.* 425
Some Relationships between Size Perception and Ego Adequacy. *Kalis, B. L.* 439
Qualitative Aspects of Beliefs About Men and Women. *Sheriffs, A. C., and McKee, J. P.* 452
The Measurement of Ego Defense as Related to Attitude Change. *Katz, D., et al.* 465
Some Effects of Status, Role Clarity, and Group Goal Clarity upon the Individual's Relations to Group Process. *Gerard, H. B.* 475
Conditions for Motivating Men: Comprehensive and Testable Models for Predicting Behavior. *Dodd, S. C.* 489
Stimulus-Response Concepts and Principles Applied to Projective Test Behavior. *Goss, A. E., and Brownell, M. H.* 505

SEPTEMBER

Stimulus-Response Analysis of Inferences from Projective Test Behavior. *Brownell, M. H., and Goss, A. E.* 525
The Interpretation of Approval and Disapproval by Delinquent and Non-delinquent Adolescents. *McDavid, J., jr., and Schroder, H. M.* 539
The Effects of Rewards and Punishments during Perceptual Organization. *Sommer, R.* 550
Personality and Psychological Stress. *Lazarus, R. S., et al.* 559
Situational Therapy. *Pace, R. E.* 578
Recall of Interrupted and Non-interrupted Tasks as a Function of Experimentally Induced Anxiety and Motivational Relevance of the Task Stimuli. *Smock, C. D.* 589
Some Relationships between Defensiveness and Self-concept Discrepancies. *Wylie, R. C.* 600
The Connotative Impact of Color on the Rorschach and its Relation to Manifest Anxiety. *Levy, L. H., and Kurz, R. B.* 617
Personality Dimensions of Emotional Responsiveness and Rigidity, and Scales for Measuring Them. *Cervin, V.* 626
Examination Deception as a Function of Residual, Background, and Immediate Stimulus Factors, *McQueen, R.* 643

VOL. 21 **J. PROJECT. TECH.** SEPTEMBER, 1957

The Clinical and Scientific Methods: Synthesis or Antithesis? *Holzberg, J. D.* 227
Objectifying the Subjective—A Methodological Approach to the TAT. *Friedman, I.* 243
Responses of School-Children to Human and Animal Pictures. *Furuya, K.* 248

Rorschach: Some Comments on Predicting Structured Behavior from Reactions to Unstructured Stimuli. *Gruen, A.* 253
The Development of the Rorschach Test in Japan. *Kataguchi, Y.* 258
Alleged Rorschach Anxiety Indices in Children. *Levitt, E. E.* 261
Quantification of the Bender-Gestalt Recall: A Pilot Study. *Olin, T. D., and Reznikoff, M.* 265
An Experimental Variation of the Draw-A-Person Technique. *Ponzo, E.* 278
The Validity, Bases, and Process of Clinical Judgment, Using a Limited Amount of Projective Test Data. *Powers, W. T., and Hamlin, R. M.* 286
The Prediction of Overt Aggressive Verbal Behavior from Rorschach Content. *Rader, G. E.* 294
Rorschach Findings in a Group of Peptic Ulcer Patients and Two Control Groups *Raifman, I.* 307
A Comparison of Several Measures of Psychosexual Disturbance. *Tolor, A.* 313
An Exploration of Relationships between Manifest Anxiety and Selected Psychosexual Areas. *Trent, R. D., and Amchin, A.* 318

VOL. 44 J. PSYCHOL. JULY, 1957

Society's Orphans: A Study in a Residential Setting of Adolescents with Problems. *Stotsky, B. A., et al.* 3
The Order of Dominance in Concept Attainment as Affected by Experience. *Forgus, D. H., and Fowler, H.* 105
The Clinic Approach to Business Communication. *Sexton, R., and Staudt, V.* 109
The Prediction of Behavior Response Patterns to Music. *Henkin, R. I.* 111
Studies in Physiognomic Perception: IV. Effect of Muscular Involvement on the Dynamic Properties of Objects. *Wapner, S., et al.* 129
Multidimensional Psychophysics: A Method for Perceptual Analysis. *Andrews, T. G., and Ray, W. S.* 133
The Time Sense: Anchor Effects and Apparent Duration. *Goldstone, S., et al.* 145
An Exploratory Study of Some Relationships Between Hospital Ward Atmospheres and Attitudes of Ward Personnel. *Fisher, S., and Morton, R. B.* 155
The Stability of W.I.S.C. I.Q.s for Selected Children. *Whatley, R. G., and Plant, W. T.* 165
The Limitations of Cattell's Space Method of Studying Eminence. *Farnsworth, P. R.* 169
The Smiling of the Infant and the Problem of Understanding the "Other". *Goldstein, K.* 175
Factors in Marital Discord. *Senoussi, A. E., et al.* 193
Retest Reliability of the Number of Responses to Music. *Sopchak, A. L.* 223
Some Personality Differences in Children Related to Strict or Permissive Parental Discipline. *Watson, G.* 227
Empirical Aspects of Polydiagnostic Research. *Bennett, E. M.* 251

OCTOBER

Effects of Various Food Deprivation Schedules on the Discrimination Learning Performance of Monkeys Irradiated with X-ray Irradiation. *Heimstra, N. W., et al.* 271
Lateral Dominance, Directional Confusion, and Reading Disability. *Harris, A. J.* 283
A Method for Evaluating Discrete, Continuous Associations. *Kimbrough, W. W., and Cofer, C. N.* 295
Hypnosis as Perceptual-Cognitive Restructuring: III. From Somnambulism to Autohypnosis. *Barber, T. X.* 299
Some Structural Aspects of Concepts. *Richter, M. N., et al.* 305
A Multidimensional Scaling Approach to the Perception of Personality. *Jackson, D. N., et al.* 311
A Comparison of Immediate Memory Span for Digits, Letters, and Words. *Crannell, C. W., and Parrish, J. M.* 319
An Experimental Test of Two Theories of Involvement in Role Playing. *Solem, A. R.* 329
The Pain Apperception Test: A Preliminary Report. *Petrovich, D. V.* 339

VOL. 2 J. PSYCHOSOM. RES. 1957

Group Psychotherapy in Bronchial Asthma. *Sclare, A. B., and Crocket, J. A.* 157
An Aetiological Study of Chronic Urticaria and Angioneurotic Oedema. *Rees, L.* 172
Peptic Ulcer and Mental Disorder—I. *Gosling, R. H.* 190
The Menstrual Cycle and Its Disorders in Psychiatric Patients—II. *Gregory, B. A. J. C.* 199
Observations on Thyroid Adrenocortical Relationships. *Gibson, J. J., and Willcox, D. R. C.* 225

VOL. 45 J. SOC. PSYCHOL. MAY, 1957

Preface to the Publication of Cross-Cultural Research. *Murchison, C.* 139
An Introduction to the Psychology of Acculturation. *Doob, L. W.* 143
On the Designing of TAT Pictures, With Special Reference to a Set for An African People Assimilating Western Culture. *Sherwood, E. T.* 161
Personal Involvement and Item Displacement on Thurstone Scales. *Prothro, E. T.* 191
Stereotypes and Semantic Space. *Prothro, E. T., and Keehn, J. D.* 197

A Study of Racial Attitudes in India. *Adinarayan, S. P.* 211
The Orthodoxy of the Authoritarian Personality. *Gregory, W. E.* 217
Societal Variations in Humor Responses to Cartoons. *More, D. M., and Roberts, A. F.* 233
Two Kinds of Accuracy in Predicting Another's Responses. *Stone, G. C., et al.* 245
Some Correlates of the Order in Which People Think of Personality Traits When Asked to List Them. *Shipley, W. C., et al.* 255
Values, Religion, and Psychoanalysis. *Sherman, M. H.* 261
The Effect of Paternal Income Upon Attitudes of Business Administrators and Students in a School of Business Administration. *Anikeeff, A. M.* 271
The Effect of Job Satisfaction Upon Attitudes of Business Administrators and Employees. *Anikeeff, A. M.* 277
Sociometric Empathy. *Anikeeff, A. M.* 283
Some Determinants of Conformity Behavior. *Wiener, M., et al.* 289
Group Pressure, Attitude Change, and Autonomic Involvement. *Lawson, E. D., and Stagner, R.* 299

VOL. 46 AUGUST, 1957

Goals Chosen by Arab Students in Response to Hypothetical Situations. *Melikian, L. H., and Prothro, T.* 3
Opinion Constancy After Formal Role Playing. *Stanley, J. C., and Klausmeier, H. J.* 11
Prediction of Group Opinion as a Function of Extremeness of Predictor Attitudes. *Ausubel, D. P., and Schpoont, S. H.* 19
Reactions to Success and Failure During Individual and Cooperative Effort. *Lichtenberg, P.* 31
The Effect of Paternal Income Upon Attitudes of Business Administrators and Employees. *Anikeeff, A. M.* 35
Role Ambiguity and Anxiety in An Occupational Group. *Wispe, L. G., and Thayer, P. W.* 41
A Comparison of Test Scores and Role-Playing Behavior in Assessing Superior vs. Subordinate Orientation. *Burwen, L. S., and Campbell, D. T.* 49
Some Factors Related to the Perception of Funniness in Humor Stimuli. *Roberts, A. F., and Johnson, D. M.* 57
The Evaluation of Intelligence in the Heterosexual Relationship. *Beigel, H. G.* 65
Measurement of Attitudes by a Simple Word Association Technique. *Havron, M. D., et al.* 81
On the Learning of Material Congruent and Incongruent With Attitudes. *Havron, M. D., and Cofer, C. N.* 91
The Social Adjustments of Puerto Ricans in Philadelphia. *Siegel, A. I.* 99
Personality Correlates of Successful Role Behavior. *Rodgers, D. A.* 111
The Success Attitude: An Analysis of the Relationship Between Individual Needs and Social Role-Expectancies. *Wispe, L. G.* 119
Some Personality Characteristics of Southern Negro Students. *Grossack, M. M.* 125
Authoritarianism and Attitudes Toward Socialized Medicine Among Senior Medical Students. *Libo, L. M.* 133

NOVEMBER

A Psycholinguistic Analysis of Some Interpretive Processes of Three Basic Personality Types. *Hamilton, R. V.* 153
School Children's Perceptions of Labor and Management. *Haire, M., and Morrison, F.* 179
Point V: Fulbright Fellows Up Against Acculturation. *Barnette, W. L., jr.* 199
The Relation of the *F*-Scale to Intelligence. *Cohn, T. S.* 207
The Perception of Feelings Among Members of Small Groups. *Tagiuri, R.* 219
Stereotypes as Social Concepts. *Vinacke, W. E.* 229
Monetary Value and the Perception of Persons. *Luft, J.* 245
Accuracy in Judging Emotional Expressions as Related to Understanding of Literature. *Weisgerber, C. A.* 253
An Approach to the Study of Aggression. *Rosen, S.* 259
Blood Donor Recruitment: A Case Study in the Psychology of Communication. *Grace, H. A.* 269
An Attempt to Predict the Performance of Three-Man Teams from Attitude Measures. *Chapman, L. J., and Campbell, D. T.* 277
Life, Reactions, and Sociology in a Number of Insects. *Schjelderup-Ebbe, T.* 287
Authoritarianism and Aesthetic Choice. *Rosenberg, B. G., and Zimet, C. N.* 293
Attitudes Towards Desegregation of Southern White and Negro Children. *Grossack, M. M.* 299
The Effect of Members' Use of a Formal Group as a Reference Group Upon Group Effectiveness. *Cohen, E.* 307
The Rank Order of Peoples: A Study in National Stereotypes. *Kosa, J.* 311

VOL. 22 **J. SPEECH HEAR. DIS.** SEPTEMBER, 1957

Plastic-Tape Sound Spectrograph. *Prestigiacomo, A. J.* 321
Effects of Duration and Articulation Changes on Intelligibility, Word Reception and Listener Preference. *Tolhurst, G. C.* 328

Intelligibility of Whispering in a Tone Language. *Wise, C. M., and Chong, L. P.-H.* .. 335
The Pitch of Side-Tone. *Black, J. W., et al.* 339
Cerebral Palsied Monovular Twins. *Skatvedt, M., and Morley, D. E.* 343
Bibliography of Publications on Speech and Hearing in Cerebral Palsy. *Mecham, M. J.* 348
Babbling and Echolalia in Language Theory. *Myklebust, H. R.* 356
Speech of Children Before and After Removal of Tonsils and Adenoids. *Greene, M. C. L.* 361
Linguistic Functioning of Bilingual and Monolingual Children. *Carrow, M. A.* .. 371
Case Study of Delayed Language. *Blackman, R. S., and Battin, R. R.* 381
Effects of Auditory Masking Upon the Speech of Stutterers. *Maraist, J. A., and Hutton, C.* 385
A Point of View About "Stuttering". *Williams, D. E.* 390

OCTOBER

The American Speech and Hearing Association 439
Pattern of Professional Growth 440
Officers and Committees 441
By-Laws of the American Speech and Hearing Association 443
Code of Ethics 450
Clinical Certification Requirements 452
Minimum Requirements for Hearing Programs Offering Guidance in Selection of Hearing Aids 462

VOL. 7 **NEUROL.** AUGUST, 1957

Syndrome of Acquired Aphasia with Convulsive Disorder in Children. *Landau, W. M., and Kleffner, F. R.* 523
Transient Astereognosis Induced by Intravenous Barbiturates. *Jaffe, R.* 531
Sequelae of Western Equine and Other Arthropod-Borne Encephalitides. *Herzon, H., et al.* 535
Paroxysmal Abdominal Pain as a Manifestation of Epilepsy. *O'Brien, J. L., and Goldensohn, E. S.* 549
Disparity Between Low Cerebral Blood Flow and Clinical Signs of Cerebral Ischemia. *Alman, R. W., and Fazekas, J. F.* 555
*Electroencephalographic Effects of Intraventricular 5-HT and LSD in the Cat. *Vogt, M.* 559
The Cerebral Collateral Circulation. 2. Production of Cerebral Infarction by Ischemic Anoxia and its Reversibility in Early Stages. *Denny-Brown, D., and Meyer, J. S.* 567

Electroencephalographic Effects of Intraventricular 5-HT and LSD in the Cat

An electroencephalographic study of the effects, in the brain of the immobilized conscious cat, of intraventricular injections of 5-HT and lysergic acid (LSD) reveals the following:

The cortical electroencephalographic effects, desynchrony with 5-HT and spindles with LSD, give little indication of more profound changes occurring in subcortical regions.

Both 5-HT and LSD characteristically depress the amplitude of activity in medial hypothalamic and thalamic nuclei and stimulate the bulbar reticular formation.

LSD evokes a high amplitude 50 per second rhythm in the pallidum, putamen, amygdala, and their propection systems, a change which roughly parallels in time the known duration of sham rage behaviour from a similar dosage of the drug.

5-HT retards the electroencephalographic activity of the same regions generally to an eight to 12 per second alpha rhythm, and again the temporal aspect of the changes correlates well with the known duration of lethargic behaviour evoked by the drug.

Doses of LSD which temporarily reverse the longer lasting behavioural lethargic effects of 5-HT similarly antagonize briefly the 5-HT effects on the electroencephalographic activity of pallidum, putamen, and amygdala.

It is suggested that "LSD-induced" high-amplitude burst of electroencephalographic activity in certain relay nuclei of the thalamus may contribute to aberrancies of sensation.

(Authors' Abstr.)

SEPTEMBER

Brain Abscesses: A Review of Ninety-Nine Cases. *Loeser, E., jr., and Scheinberg, L.* 601
Postchordotomy Studies of Pain Threshold. *King, R. B.* 610
Specificity of Facilitatory and Inhibitory Effects of Upper Brainstem Stimulation. *Austin, G., and Jasper, H.* 615
A Short Examination for Aphasia. *Schuell, H.* 625
Digital Carotid Artery Compression with Occlusion of the Anterior Cerebral Artery. *Gurdjian, E. S., and Webster, J. E.* 635
Definitions of Cerebral Palsy and Their Role in Epidemiologic Research. *Kurland, L. T.* 641
A Clinical Test for Sound Localization and Its Applications. *Sanchez Longo, L. P., et al.* 655

OCTOBER

Significance of Symptoms and Signs in Localization of Involved Root in Cervical Disk Protrusion. *Yoss, R. E., et al.* 673
Direct Current Recordings of Eyeball Movements in Neurologic Practice. *Cohn, R.* 684

*Hypothalamic Seizures from Stimulation of Rhinencephalon and Isocortex in Cat. *Powell, E. W., et al.* .. 689
Treatment of Bell's Palsy. *Jongkees, L. B. W.* .. 697
The Electroencephalogram in Microcephaly. *Fois, A., and Rosenberg, C. M.* .. 703
Hematoencephalic Exchange as a Function of Age. *Himwich, W. A., et al.* .. 705
Peripheral Nerve Tumors as a Cause of Pain in the Lower Extremities. *Gross, S. W., and Schwartz, A.* .. 711
Metachromatic Form of Diffuse Cerebral Sclerosis. 2. Diagnosis During Life by Isolation of Metachromatic Lipids from Urine. *Austin, J. H.* .. 716
An Electroencephalographic Syndrome which Correlates with Severe Disruption of the Personality Structure. *Rodin, E. A.* .. 724

Hypothalamic Seizures from Stimulation of Rhinencephalon and Isocortex in Cat

1. Hypothalamic seizure activity can be elicited by stimulation of amygdala, hippocampus, hippocampal gyrus, septum, and basal olfactory structures. The ventromedial nucleus is a prominent focal area of the hypothalamus for reception of "epileptic" impulses from the above structures. Stimulation at the same parameter of the ventral and of the dorsal portions of the hippocampus affected different parts of the hypothalamus. The hippocampal gyrus appears to by-pass the hippocampus in its projection to the hypothalamus. Stimulation of the posterior portion of the lateral amygdaloid nucleus produces longer seizure activity in the hypothalamus than do anterior portions of this nucleus. Results indicate that the amygdala affects the ventromedial hypothalamus directly and the mammillary body indirectly through the hippocampus. For reasons unaccounted for repeated constant stimulations of the same structure may result in seizures of varying character in the hypothalamus.

2. Stimulation of the dorsolateral isocortex at a constant, critical parameter showed that not all areas were epileptogenic for the hypothalamus. The most effective cortical epileptogenic areas were found in the temporal and occipital regions. Areas outside the temporal and occipital isocortex became epileptogenic with respect to the hypothalamus when stimulated at high voltage and long duration, and only after spread to temporal areas had occurred.

3. Some clinical implications relative to autonomic and psychomotor epilepsy and emotional states are discussed.

(Authors' Abstr.)

NOVEMBER

Poliomyelitis. 16. A Study of Pulmonary Edema. *Baker, A. B.* .. 743
Reading Epilepsy. *Bingel, A.* .. 752
Observations Upon Responses to Digital Carotid Artery Compression in Hemiplegic or Hemiparetic Patients. *Webster, J. E., and Gurdjian, F. S.* .. 757
Dispersion of Fluid Materials in Intracerebral Injections: General Observations in Conjunction with Injection Lobotomy and Chemopallidectomy. *Housepian, E. M., and Guzman-Lopez, M.* .. 763
Electroencephalographic Evaluation of Treatment in Obstructive Disease of the Basilar and Carotid Arteries. *Meyer, J. S., et al.* .. 765
A Clinical Study of 100 Aphasic Patients. 1. Observations on Lateralization and Localization of Lesions. *Brown, J. R., and Simonson, J.* .. 777
Spirodon (Tetrantoin): A New Anticonvulsant of the Hydantoin Group. *Putnam, T. J., and Jacobs, J.* .. 784
Hydatid Cyst of the Brain and Its Treatment. *Griponissiotis, B.* .. 789
Neurologic Diagnosis of Pancreatic Islet Cell Adenomas with Hyperinsulinism. *Richardson, J. C., and Hill, F. M.* .. 793

VOL. 37 **PHYSIOL. REV.** JULY, 1957

Fatigue and Inadequacy. *Bartley, S. H.* .. 301
Electrical Inexcitability of Synapses and Some Consequences in the Central Nervous System. *Grundfest, H.* .. 337
Enzymatic Mechanisms in Steroid Metabolism. *Talalay, P.* .. 362

VOL. 71 **PISANI.** 1957

A Case of Toxic Psychosis. *Matarasso, A.* .. 209
The Association of Epilepsy and Schizophrenia. *Matarasso, A.* .. 215
Experimental Research on the Relation Between the EEG, Vestibular Dominance and the Body Schema. *Ragonese, G., and Vitetta, M.* .. 224
Suprarenal Cortical Function in Schizophrenia. *Papalia, A., and Staropoli, D.* .. 237
Suprarenal Cortical Function in Schizophrenics Treated with E.C.T. *Papalia, A., and Staropoli, D.* .. 253
Modification of Glucose Level Following Treatment with Benactazine. *Gattuso, R., and La Boria, G.* .. 265
Clinical Studies of the EEG under Benactazine. *Gattuso, R.* .. 269
Long-term Results of Largactil Treatment in Chronic Psychoses. *Riras, M., and Circo, P.* .. 287

The Dysthymic State in Psychiatry. *Poli, C.* 339
The Representation of the Indistinct in a Homogeneous Group of Normal Adults. *Santangelo, F.* 351
An Experimental Research on the Histological Behaviour of Guinea-pig Organs after Chlorpromazine. *Santangelo, F., and Viviano, M.* 373

VOL. 20 **PSYCHIAT.** MAY, 1957
The William Alanson White Memorial Lectures, Fourth Series. *Buber, M.* 95
Social Perception in Russian Displaced Persons and An American Comparison Group. *Hanfmann, E.* 131
The Dream of the Object Endangered. *Harris, I. D.* 151
On the Unreliability of Reliability and Some Other Consequences of the Assumption of Probabilistic Patient States. *Chassan, J. B.* 163

AUGUST
On Some Convergences of Sociology and Psychiatry. A Psychiatrist's View. *Cohen, R. A.* A Sociologist's View. *Goffman, E.* 199
Techniques of Sociotherapy. *Sivadon, P. D.* 205
The Treatment of Personality Disorders in a Therapeutic Community. *Jones, M.* .. 211
Social Controls and Psychiatric Theory in a Ward Setting. *Perry, S. E., and Shea, G. N.* 221
Patient Demands in a Mental Hospital Context. *Schwartz, M. S.* 249
Patient Role and Social Uncertainty—A Dilemma of the Mentally Ill. *Erikson, K. T.* 263
Perspectives on Deviance—Wives' Definitions of Their Husband's Mental Illness. *Schwartz, C. G.* 275
A Multidimensional System for Analyzing Psychotherapeutic Techniques. *Strupp, H. H.* 293

VOL. 31 **PSYCHIAT. QUART.** APRIL, 1957
An Appraisal of Existential Analysis. I. *Kahn, E.* 203
Intractable Episodic Vomiting in a Three-Year-Old Child. *Berlin, I. N., et al.* .. 228
The Syndrome of Capgras. *Todd, J.* 250
A Theory of Diagnosis as Applied to the Treatment of a Case of Paraphrenia. *Azima, H.* 266
The Treatment of Drug and Alcohol Withdrawal Effects with Thorazine. *Sainz, A. A.* 275
Erythremia (Polycythemia Vera) as a Complicating Factor in Electric Shock Therapy: Case Report. *Gibbs, W. F., and Gralnick, A.* 285
Sodium Amytal as an Aid in State Hospital Practice: Single Interviews with 100 Patients. *Cohn, W. M., et al.* 289
Hostility as a Barrier to Therapy in Alcoholism. *Selzer, M. L.* 301
Reflections on the Nature and Psychiatric Aspects of Cryptogenic Epilepsy. *Davidson, G. M.* 306
Psychodynamic Patterns in Sex Offenders: A Four-Factor Theory. *Hammer, E. F., and Glueck, B. C., jr.* 325

VOL. 26 **PSYCHO-ANAL. QUART.** 1957
The Meanings and Uses of Countertransference. *Racker, H.* 303
The Role of Narcissism in Moral Masochism. *Bernstein, I.* 358
Penelope's Character. *Devereux, G.* 378
Teaching and Learning of Psychoanalytic Psychiatry in Medical School. *Szurek, S. A.* 387

VOL. 19 **PSYCHOSOM. MED.** JULY-AUGUST, 1957
Autonomic Nervous System Responses Related to the Funkenstein Test: I. To Epinephrine. *Clemens, T. L.* 267
Psychoanalytical Observations in Two Cases of Thrombophlebitis Migrans. *Millet, J. A. P., and Dyde, J. F.* 275
Phantasies of Tuberculosis Patients. *Streeter, G. A.* 287
Psychosomatic Differentiation in Infancy: I. Autonomic Activity in the Newborn. *Grossman, H. J., and Greenberg, N. H.* 293
Some Psychological Concomitants of Tuberculosis and Hospitalization: A Preliminary Study. *Muldoon, J. F.* 307
Group Differences in the Incidence of Upper Respiratory Complaints Among College Students. *Summerskill, J., and Darling, C. D.* 315
Excretion of Hippuric Acid in Schizophrenic and Depressive Patients after E.C.T. *Fabisch, W., and Fellner, C.* 320
Denial Mechanisms in Masked Epilepsy. *Tippett, D. L., and Pine, I.* 326
Rorschach Study on the Nature and Origin of Common Factors in the Personalities of Parkinsonians. *Machover, S.* 332

SEPTEMBER-OCTOBER
Depth Electrographic Recording of a Seizure During a Structured Interview: Report of a Case. *Groethuysen, U. C., et al.* 353
Autonomic Nervous System Responses Related to the Funkenstein Test: II. To Mecholyl. *Clemens, T. L.* 363

The Reliability of the Mecholyl Test. *Lotsof, E. J., and Yobst, J.* 370
Electric Shock Therapy and the Mecholyl Test. *Lotsof, E. J., and Yobst, J.* 374
Patterns of Emotional Recovery from Hysterectomy: First in a Series of Reports. *Menzer, D., et al.* 379
Observations on Psychological Aspects of Anorexia Nervosa: Report of a Case. *Meyer, B. C., and Weinroth, L. A.* 389
Musicogenic Epilepsy: Report of Three Cases. *Daly, D. D., and Barry, M. J., jr.* .. 399
Countertransference Reactions to Cancer. *Renneker, R. E.* 409
A Note on the Influence of Climatic Factors on Psychophysiological Investigations. *Watson, P. D., et al.* 419

VOL. 18 QUART. J. STUD, ALC. SEPTEMBER, 1957

Effect of Aminotriazole on Alcohol Metabolism and Hepatic Enzyme Activities in Several Species. *Nelson, G. H., et al.* 343
Disulfiram and Anesthesia. A Review of the Literature. *Møller-Madsen, A.* 349
The Use of Milk and Wine in Italy. *Luzzatto-Fegiz, P., and Lolli, G.* 355
A Short Form of the Wechsler-Bellevue Scale, Form II, for Alcoholic Outpatients. *Schneyer, S.* 382
*Private Hospital Alcoholic Patients and the Changing Conception of the "Typical" Alcoholic. *Wellman, W. M., et al.* 388
The Religious Background of Fifty Alcoholics. *Walters, O. S.* 405
*Choice of Alcoholic Beverage Among 531 Alcoholics in California. *Terry, J., et al.* 417
Effects of Clinical Treatment on Behavior of Alcoholic Patients. An Exploratory Methodological Investigation. *Gibbins, R. J., and Armstrong, J. D.* 429
H-Technique Scales of Preoccupation with Alcohol and of Psychological Involvement in Alcoholics: Time Order of Symptoms. *Jackson, J. K.* 451
*Reserpine as an Adjunct in the Treatment of Alcoholism. *Greenhouse, H. R., and Pilot, M. L.* 468
Casework Treatment of an Alcoholic Woman with Severe Underlying Pathology. *Markham, J.* 475
The States in the Liquor Business. Some Observations on Administration. *Barker, T. W., jr.* 492

Private Hospital Alcoholic Patients and the Changing Conception of the "Typical" Alcoholic

There has been a widespread misconception that alcoholics are usually characterized by a low degree of marital and occupational integration.

The support given to this misconception by most early systematic studies was a product of the kind of alcoholic populations available for study in mental hospitals, through police departments, relief agencies, and the like.

Malzberg's 1948 study of the New York State "alcoholics without psychosis" was the first to reveal a sizable population of alcoholics showing a high degree of marital and economic stability.

Straus and Bacon's study of over 2,000 male patients of the 9 pioneer clinics for alcoholics dealt the old stereotype a decisive blow. The typical clinic patient, they found, was still living at home keeping his marriage intact, and holding a steady job.

The present study has presented comparable data on the male patients of a large private hospital for alcoholics, the Shadel Hospital in Seattle, Washington. These patients were found to be characterized by an even greater—and substantially greater—degree of marital and occupational stability than was true of the clinic patients.

The differences indicate that the Shadel patients, as a group, had the highest degree of marital and occupational stability yet reported for any sizable alcoholic population.

This study, therefore, gives strong support to and broadens the base of the logic of the clinic study—that most alcoholics do not present a picture of considerable social and personal disorganization but rather of a fairly high degree of marital and occupational stability.

With some 4,500,000 alcoholics in the United States, and with only a fraction of them reaching Skid Rows or showing up for treatment, the vast majority must still be functioning in society in fairly normal fashion, hidden from general recognition. And to a large extent they are hidden by their failure to be as disorganized as the old stereotype would have the alcoholic be—hidden, in other words, by their surprisingly high degree of social and occupation stability.

The implications of this conclusion are far-reaching, suggesting a substantial refocusing of attention and effort on the part of rehabilitators, researchers and educators concerned with the problems of alcoholism.

(Authors' Abstr.)

Choice of Alcoholic Beverage among 531 Alcoholics in California

1. As part of a series of studies on the drinking habits of alcoholics, an investigation was conducted on 531 alcoholic subjects—491 men and 40 women—selected by the police for treatment at the Santa Rita Rehabilitation Center, Alameda County, California.

2. The group included 60 per cent. Protestants, 35 per cent. Catholics, and less than 1 per cent. Jews.

3. In comparison with major nationality groups in the surrounding area, the proportion of subjects with Irish and English backgrounds was relatively high, while the proportion of those with Italian, German and Canadian backgrounds was strikingly low, but the possibility of bias in the selection of the sample could not be ruled out.

4. The education of these alcoholics was limited, and their occupations were commensurate with their educational status. Nearly 20 per cent. were unemployed.

5. A generally unsatisfactory marital status was indicated by the finding that 18 per cent. of the subjects were single, 53 per cent. were either separated or divorced, and only 1 per cent. were living with their spouses. The marital status of 20 per cent. was not given.

6. Before their present commitment the majority of these alcoholics had received no treatment for their alcoholism, and inadequate treatment had been received by most of the others. Less than 40 per cent. of them had ever been exposed to the fellowship of Alcoholics Anonymous.

7. At the time of their earliest drinking experiences, distilled spirits represented the alcoholic beverage preferred and used by the majority of these alcoholics. Beer was ranked second and wine third, representing the beverage of choice for only about one-sixth of the group.

8. In their present drinking patterns, the majority of these subjects still express a preference for distilled spirits, but only 29 per cent. of the group are able to use spirits chiefly. On the other hand, although wine is still preferred by only one-sixth of the group, it is now the beverage of chief use of 49 per cent.

9. The drinking episodes of the alcoholics in this group appear to be rather lengthy, 45 per cent. of the subjects reported episodes lasting a week or more.

10. During a drinking episode, wine is used by 25 per cent. of the alcoholics at the onset, by 45 per cent. at the peak, and by 61 per cent. at the end.

11. An analysis of the data dealing with the so-called "winos"—those alcoholics who now use wine as their chief beverage—indicates that the majority of these individuals have always preferred alcoholic beverages other than wine since the time of their earliest drinking experiences. In the great majority of cases the present use of wine for their sprees seems to be determined almost exclusively by the circumstance that wine is the cheapest source of ethyl alcohol available to them.

12. The data do not support popular notions that "winos" or wine-using alcoholics are specifically addicted to wine, nor that alcoholism is related to the use of any particular type of alcoholic beverage.

(Authors' Abstr.)

Reserpine as an Adjunct in the Treatment of Alcoholism

A study of the effects of reserpine as an adjunct in the treatment of alcoholism was carried out in 71 patients in an outpatient clinic devoted solely to the treatment of alcoholism. The dose of reserpine used was 0·25 mg. 3 times a day. Of the 71 patients, the results in 30 cases could not be evaluated because of broken contact and must be presumed to be unfavourable. Of the remaining 41 the drinking patterns of 9 were not favourably affected by reserpine. In 2 of these 9 patients reserpine appeared to exacerbate the symptoms. In 32 cases reserpine seemed to help the patient achieve a measure of sobriety; 27 maintained sobriety for 12 months or longer; 3 for 6 months; and 2 for a 3-month period.

(Authors' Abstr.)

VOL. 9 QUART. J. EX. PSYCHOL. AUGUST, 1957

The EEG, Visual Imagery and Attention. *Oswald, I.* .. 113
The Human Operator as a Single Channel Information System. *Davis, R.* .. 119
The Perception of a Rotating Shape. *Yensen, R.* .. 130
Influence of a Depressant Drug on Acquisition in Rote Learning. *Steinberg, H., and Summerfield, A.* .. 138
Reducing Interference in Forgetting. *Summerfield, A., and Steinberg, H.* .. 146
Method of Serial Extrapolation. *Beloff, J.* .. 155
The Developmental Study of Apparent Movement. *Brenner, M. W.* .. 169

VOL. 46 RASS. STUDI. PSICHIAT. 1957

Consideration of Arterio-sclerotic Dementia. *Fattovich, G.* .. 1
Lymphocytic and Serous Meningitis. *Maganzani, L.* .. 20
Severe Phrenasthenia Associated with the Syndromes of Klippel Feil and Turner. *Senini, G., and Pelligrini, G.* .. 38
The TAT in Paranoid Schizophrenia. *Sagripanti, P.* .. 63
Schizophrenia Associated with a Hypothalamic-Hypopituitary Syndrome. *Pelligrini, G., and Senini, G.* .. 297
EEG Aspects of Narcolepsy. *Inghirami, L., and Mannironi, G.* .. 314
A Case of Hypoglossal Paralysis. *Cannizzaro, C.* .. 329
Biological Effects in Treatment with Cytotoxic Antireticular Serum. *Pappalardo, P., and Buffa, B.* .. 334
EEG Study in Mental Illness during Drainage of the C.S.F. According to the Technique of Speransky. *Masciocchi, A., and Cazzola, G.* .. 371

A Rare Case of a Pituitary Chromophobe Adenoma in a Girl of Eleven. *Biagini, R.* 467
The Value and Limitations of Radiology in Dysphagia of Nervous Origin. *Manniroui, G., and Ruia, A.* 489
A Case of Kleptomania Treated by Transorbital Leucotomy. *Salvatores, U.* 513
The EEG During Treatment with Chlorpromazine. *Miglio, G., and Bianchetti, L.* 521
The Wartegg-Zeichnen Test in Schizophrenia. *Barontini, F.* 536
Foix and Alajouanine's Disease. *Linoli, O.* 607
Nervous Leprosy. *Masiocchi, A.* 631
A Case of Cushings Syndrome Associated with Schizophrenia. *Pellegrini, G., and Senini, G.* 657
The Association Between Encephalitis and Hysteria. *Nujel, A., and Giovanelli, G.* 669
The Diary of a Paranoiac. *Tolentino, I.* 681
Representation of the Indistinct and of the Contemplative Attitude in Schizophrenia. *Pescetto, G.* 731
The Blood Glutamine in Schizophrenia. *Nugel, A.* 749
Histochemical Study of Particular Artefacts from Formalin Preservation of the Brain in White Rats. *Linoli, O.* 755

VOL. 4 **REV. ALCOOL.** 1957
Metabolic Disturbances of Alcoholic Illness and their Relation with Neuro-muscular Excitability. *Lecoq, R.* 131
Recent Work on the Treatment of Alcoholism with Antabuse. *Vicillefosse, R., and Weizmann, H.* 142
The Diagnosis of Acute Alcoholism after Accidents. *Simonin, C., and Moureau, P.* 157
The Problem of Penal Responsibility in Different Forms of Ethyl Intoxication. *Michel, B.* 181

VOL. 96 **REV. NEUROL.** APRIL, 1957
A Considerable Non-parasitic Blood Eosinophilia with Pulmonary Infiltration Associated with a Chronic Cerebellar Syndrome. *Alajouanine, T., et al* 269
Carcinomatitic Meningitis Secondary to a Cancer of the Breast. *Sigwald, J., et al.* 286
Paralysis of Vertical Gaze of Vascular Origin. *Angelerguis, R., et al.* 301

MAY
The History of the Syndrome of Claude Bernard. *Bonnet, P.* 365
Tchecoslovak Encephalitis with Tics. *Henner, K., and Hanzal, F.* 384
Some Observations on the Problem of the Classification of Cerebral Tumours. *Arseni, C.* 400

JUNE
Recording and Stimulation of Rhinencephalic Formations with Electrodes Placed Deep in Man. *Walker, A. E., and Ribstein, M.* 453
Motor Conditioning in Old Age and During Sleep. *Roger, A., et al.* 460
Comparative Study of EEG, etc. During Experimental Convulsions. *Colle, J., et al.* 470
The Quantitative EEG of Man During the Induction of Sleep by Nembutal. *Drohocki, Z.* 475
Cerebral Electrical Activity of the Guinea-pig Non-anaethetised and Non-curarised and its Modification in Different Experimental Conditions. *Gonsette, R.* 490

VOL. 97 JULY
Two Cases of Lumbar Ganglioneuroma with Compression of the Spinal Cord. *Grossiord, A., et al.* 3
Acute Meningoencephalitis of Indeterminate Origin and Favourable Outcome. *Radermecker, J., et al.* 21
The Syndrome "Hemiconvulsion-Hemiplegia-Epilepsy". *Gastaut, H., et al.* 37

AUGUST
Multiple Intraspinal Cholesteatomata. *Olconomos, D., and Caracalos, A.* 81
An Electro-clinical Study of a Viral Meningoencephalitis. *Gastaut, H., et al.* 102
A Contribution to the Study of Central Forms of Recklinghausen's Disease. *Rodriguez, B., et al.* 109
Disorders of Speech Associated with Lesions of the Posterior Frontal Inter-hemispherical Surface. *Guidetti, B.* 121

VOL. 27 **RIV. NEUROL.** 1957
Disturbances in Language in Occlusions of the Carotid and its Branches. *Floris, V., et al.* 1
Clinico-angiographic Considerations in Problems of Hemiplegia in Thrombosis of Cerebral Arteries. *Castorina, G., and Francesconi, G.* 71
Disturbances of Sexual Function in Two Cases of Temporal Epilepsy. *Marchini, E., and Sinisi, C.* 97

EEG Alterations in Cerebral Angiomas. *Floris, V., and Maccaquani, F.*	107
Considerations upon the Problem of EEG Epileptogenic-Cortical Foci without Corresponding Anatomical Lesion. *Maspes, P. E., and Marossero, F.*	134
Neurophysiological Study of the Action of Succinylcholine on Motor Plaques in Man. *De Renzi, E.*	147
The Action of Hydroxyzine on the Electrical Activity of the Rabbit Cortex. *Floris, V., and Morocutti, C.*	233
Amyotrophic Lateral Sclerosis after Amputation of the Right Arm. *Riccio, D., and Severini, P.*	261
The Electroclinical Pattern of Seizures Induced by Rapid Intravenous Injection of Ammonium Chloride. *Marossero, F., and Migliore, A.*	271
Electromyographic Examination in Traumatic Peripheral Facial Paralysis. *Bergamini, V., et al.*	287
Flexion Paraplegia in Suprasellar Tumours. *Severini, P.*	303
Some Biochemical Modifications in Epileptics after Hyperpnoea. *Mariani, E., et al.*	318
Febrile Convulsive Syndromes in Children Resembling Encephalitic States. *Carazutti, G. B.*	332
Eleventh Reunion of the Italian Society of Neurology.	353
The Action of Cycloserine on the Brain of Rabbits. *Morocutti, C.*	473
Cerebral Thrombophlebitis. *Severini, P.*	493
The Impact of Largactil in Neurology. *Morocutti, C.*	554
The Action of Acetazolamide on the EEG of Epileptics. *Marchini, E., and Severini, P.*	583
The Surgical Treatment of Saccular Intracranial Aneurysms. *Guidetti, B.*	609
Pontine Hemorrhage and the Occipital Lobe. *Scarcella, G.*	639
Observations on the Electrical Activity of the Brain in Epileptic Convulsions. *Morocutti, C., and Vizioli, R.*	669
The Variations in the Phosphatase Activity of the Whole Brain in Guinea-pigs Treated with Endoperitoneal Ritalin. *Mariani, E., and Severini, P.*	677
A Case of Arteriovenous Malformation of the Head of the Caudate Nucleus Successfully Operated on. *Scarcella, G.*	681
Three Cases of Wallemberg's Syndrome of Gradual Onset. *Laterza, A., and Tagliacozzo, R.*	692
A Giant Pituitary Adenoma with Involvement of the Hypothalamic Region. *Frighi, L., and Merigliano, D.*	699

VOL. 78 RIV. PAT. NERV. MENT. 1957

The Importance of an Angiocardiopathic Factor in the Syndrome of Colard and Falret. *Mattioli-Foggia, C.*	1
A Study of the Protein Lipid and Glucoprotein Situation in Senile and Arteriosclerotic Dementia. *Antonini, F. M., et al.*	13
On the Importance of Dysmetabolic Factors in Senile and Arteriosclerotic Dementia. *Piazzesi, W.*	32
The Behaviour of Potassium and Calcium in Some Forms of Infantile Neuropsychiatric Conditions. *Cantarutti, F., and Sacerdoti, G.*	53
Scapulo-crural Diplegia, a Bilateral Syndrome of the Anterior Cerebral Artery. *Manghi, E., and Saginario, M.*	61
The Syndrome of Thieberg-Weissembach. *Zambianchi, A.*	79
Disturbances of Hearing in Multiple Sclerosis. *Cannizzaro, C.*	86
Cranio-cerebral Metastases. *Boeri, R., and Negri, S.*	93
Suicidal Attempts in Schizophrenia. *Rizzo, E. M.*	105
The Fundamental Disturbance in Myasthenia and Myastheniform Syndromes. *Pinelli, P.*	121
A Contribution to our Knowledge of the Glucose Exchange in Acute Febrile Confusional Syndromes. *Royer, R.*	268
The Myasthenic Syndrome. *Piazzesi, W.*	281
The Behaviour of Fundamental Substances of the Central Nervous System in Senile Plaques. *Fabiani, F.*	293
Histopathological Alterations in the Nervous System in Herpes Zoster. *Barontini, F.*	304
A Rare Complication of E.C.T., Spontaneous Idiopathic Pneumothorax. *Micheletti, V., and Inga, E. F.*	319
A Diffuse and Infiltrating Meningioma Associated with Recklinghausen's Disease. *Carrieri, G.*	333
Post-operative and Post-traumatic Psychoses. *Barucci, M., and Cossio, M.*	355
Mental Tests in Evaluating the Personality after Transorbital Leucotomy. *Fabbri, W.*	393
The Pathogenesis of Allergic Acute Experimental Encephalomyelitis. *Borgna, E., and Terranova, R.*	409
The Ontogenesis of the Facial Motor Nucleus in Man. *Fabiani, F.*	421
A Contribution to our Knowledge and Interpretation of the Extra-pyramidal Syndrome with Reserpine. *Barucci, M.*	483
The Development of the Personality in the Criminal. *Imberciadori, E.*	503

Extensor Hypertonia from Hemorrhage in the Pons. *Manghi, E., and Saginario, M.* .. 529
Tumours of the Ponto-cerebellar Angle. *Cannizzaro, C.* 549
Histochemical Study of Senile Plaques. *Schiffer, D.* 571
The Effect of "Termina" in Some Mental Diseases. *Colombi, A.* 601
The Modification of the Serum Protein Picture in Subjects Treated with Meprobamate. *Borgna, E., and Giannelli, A.* 536

Photograph by Pace

LESLIE COLIN COOK
President 1958-59

[*Frontispiece*